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LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

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PROPRIETORS: WALTER KING, LIMITED. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Central 6055. —— Telegrams: "GASKING, FLEET, LONDON."

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EDITORIAL NOTES.

Coke-Oven Gas Project for all Germany.

THERE threatens to be something in the nature of a small-scale civil war in Germany. The rivals are, on the one side, the Ruhr coke-oven owners, and, on the other, those who rule the destinies of the German gas industry. What the former, before and behind the scenes, are trying to do is to bring about a condition of things in respect of the gas supply of Germany much the same as is being done in regard to electricity in our own country. There have been, as brief references in our columns have shown, indications of this movement in Germany for some months past; but now we have fuller information (reproduced on a later page) which shows that the movement is taking more definite shape, and that the powerful iron, steel, and coal interests of the Ruhr are trying to strengthen their forces for the struggle for a monopoly of gas production, and are making good efforts to induce the Government to give them their blessing and what they desire.

The iron, steel, and coal magnates in Germany are, as we have said, powerful; and what is more, they are not without influence in the political life of that country. But they are not philanthropists; they want to have the whole gas production of the country concentrated at the mines and the coke-ovens—in other words, they are operating to get the entire supply of fuel, raw and manufactured, to Germany confided to the tender mercies of the few, and for their profit. But, so far, we have not seen published their ideas of guarantees respecting price when the gas-works are no longer operating, and continuity of supply in times of internal or international trouble. These are matters which require looking into more narrowly from the side of the people than from those of the colliery owners. These estimable gentlemen urge that the conversion of the undertakings of the gas industry into the condition of simple purveyors of the gas produced by coke-ovens at the pithead will be in the economic interests of the nation, and give the communities gaseous fuel at a lower price than is possible in present circumstances. These statements require to be examined very critically; and, if there is development, safeguards must be framed for the permanent defence of the community, for it is a big thing to entrust not only the gas supply, but the whole fuel supply in any form to the hands of a comparatively few men. The lessons of the coal stoppage in this country ought not to be lost upon the people of Germany. The gas undertakings here—distributed about the country, and prepared for the stoppage—enabled the domestic life and a large part of the services of the country to be continued normally. The placing in this respect of any nation's "eggs" in one basket would be a very impolitic proceeding. In our opinion, equally important to national economy is the question of the people's security, in which connection "Safety First" is a good motto. Experience assures us that, apart from other considerations, the greatest safety is in the retention of the best situated gas-works, and the supply of the surrounding districts from them.

Although the information to hand regarding the German scheme is fuller than has been vouchsafed hitherto, it falls very far short of what is necessary to seal finally the project as one that is best in the genuine interests of the country. The promoters of the revolutionary scheme look at the matter almost exclusively from their own side. So far as we have seen (perhaps our information is not complete) they say nothing regarding the capital already invested in the gas-producing plant of the country, or as to the compensation of those who have expended the money for this purpose. They know, as well as we do, that the transmission lines, the collecting and district holders, the pumping machinery, and all the work associated with high-pressure transmission will cost an enormous sum of money; and they blandly suggest that the Government should, in the national interests, lay down the plant. At the same time, it will be seen, from the translation on another page, that the promoters anticipate an enormous profit by selling the gas at (say) 7½d. per 1000 c.ft. on a 500 B.Th.U. basis, while it is admitted that to them it is, as a bye-product and for their own use, not worth more than 4d. The coal owners also see that it would give them an opportunity of profitably disposing of their small coal. Thus, the marvel to others is why it should be thought the Government should be so considerate to them as to provide, for their enrichment, the wherewithal to develop their own business. There is a finesse about the whole project which, we should imagine, is too palpable to lure the Government into doing anything at the public expense, or by imposing compulsion upon the gas industry. The Government have to consider, too, the question of whether it would be of national advantage for them to expend money in this way to deprive the State railways of the income obtained from the carriage of much coal. There is something curiously fantastic about that. It is true there will be more coke to transport from the Ruhr about the country; it is also true that coke such as is useful to the domestic consumer is all the better for not having to undergo long railway journeys. There are also the other commodities obtained from the carbonization of coal which are to-day required in the districts around every gas-works, and which (if the coke-oven gas scheme was eventually consummated) could only be supplied to them and industry by the combination of coal owners. Furthermore, the making of gas for town supply gives employment to men in every city and town; that employment, or less per unit of production, would be shifted to the coke-ovens. That is a point which should be considered by every municipal authority in Germany, as well as the fact that the payments in rates (we suppose public utility concerns pay them there as here) would be reduced by the closing-down of the local gas-producing works. Another tendency in this direction would be for many industrial establishments to migrate nearer and nearer the coke and gas-producing centres away from their present geographical situations, if tempting prices were offered them in respect of gaseous and solid fuel. Too much concentration of industry is not a good thing for the other parts of the country, which are thereby industrially impoverished. There is other great danger in such massing, which need not be specifically defined.

The promoters of the scheme, on the other hand, point to the large increase in gas consumption that there has been in the areas surrounding the coke-ovens, which have been supplied by them with gas at a lower rate. That increase is no criterion for all places. It may be that, in

more distant cities and towns, business in gas has been better developed, and that the annual rate of increase would not, and could not, therefore be so great. Anyway, the existing gas undertakings, as business increases, given a reasonable price of coal, will be able progressively to reduce the price of gas, and thus give the impetus which a moderate price always supplies (having regard to local characteristics and opportunities) to the extension of consumption.

Some data are given in the article in later columns respecting the initial part of the scheme; but we will not examine the figures here. However, the position and its developments will be watched with peculiar interest in this country; for it is clear that a serious attempt is to be made in Germany to open a new chapter in the history of town-gas supply.

Gas Inspection Work in an American City.

A good friend in America, interested in the articles and reports which have been published in the "Journal" regarding the inspection and maintenance of consumers' gas appliances, has placed at our disposal a large amount of information concerning the inspection and maintenance practices of his own undertaking. He, however, asks us to omit the name of the city to which the work refers. This request we must respect, though feeling that credit should be given to a concern making inspection of the appliances of hundreds of thousands of consumers, and over a course of years long before the subject of maintenance became a general topic in the gas industry of this country. In the present issue, we will only refer editorially to the extent of the work, leaving a review of the "Instructions for Gas Supply Inspectors" for subsequent issues. This, when published, will enable British gas managers, with systems of their own in operation, to make comparison of the work done, and the reasons for undertaking it, in a representative American city.

This branch of the operations of the undertaking is carried on under the title "Gas-Supply Inspection Work." This means the periodical visits paid to the house of each consumer for the free examination of the conditions of gas supply, the adjustment of appliances, and the free remedy of any troubles, charging only for a repair part for an appliance, or for a system of piping, &c. The inspection work, our correspondent informs us, started about seven years ago; and in less than five months from now, three complete rounds of the city will have been made. The total number of consumers is approximately 485,000. The records show that there is failure to gain entrance to about 17 p.ct. of the total houses visited, because no one is at home; the number of refusals to admit when some one is at home is negligible. Regarding the expenditure of time on the work, a man will—according to the number of appliances in use, and to the age of the house—complete from fifteen to twenty-five jobs per nine-hour day. The average cost per job is about $0.35, of which $0.31 is productive and overhead labour—the remainder, $0.04, being for transportation, material, and sundries. For this work about twenty-five men form the nucleus of the inspection team; and these are augmented during slack seasons of the year in the district shops of the Distribution Department by about the same number. In other words, instead of laying-off the regular shopmen at slack seasons, they are placed on gas-supply inspection work—thus benefiting them individually, and giving a reserve force of shopmen ready at any time to meet seasonable increases in the shop work. The inspectors operate in gangs of from five to eight men in various parts of the city. In addition to this work, which the Company regard as periodical maintenance, they spend per annum about $150,000 in looking after complaints as received in connection with fuel and illuminating appliances. This work might be termed "request maintenance."

The instructions for gas-supply inspectors extend to thirty rules, covering many points—such as relations with the public, object of work, deportment and habits, method of making general examination of gas supply, adjustment of burners, appliances of proper design, leaks, care of gas-meters, meter accuracy test, automatic fuel appliances, limits of free and charge work, helpful hints for workmen, and so forth. Turning to the rule regarding the limits of free and charge work, it is seen that inspection covers everything from the piping between the street and the meter onwards to the burner tips. The rule reads, "There is no charge made to the consumer by the Company for any work done on the meter itself or the piping between the street and the meter, unless the consumer or a mechanic, other than a gas man, is responsible for the breaking of a meter cock. The consumer will be charged for all work between the meter and the burner except the following, which will be free of charge: Installing mantles (made by Welsbach Company only) belonging to consumer. Adjusting lighting burners and fuel appliances. Placing or replacing gauze in lights. Repairing small gas leaks at lights, fixtures, cocks, and fuel appliances. Removing stoppages from lights, fixtures, fuel appliances, and piping. Replacing not more than three open flame burners for one consumer, provided existing burners cannot be made satisfactory. Cementing gas-range burners. Replacing No. 90 tip on No. 6 burner with No. 90½ tip, provided adjustment cannot be made with No. 90 tip." It will be seen from the foregoing that the free work is of a comprehensive nature, with a view to the maintenance of efficiency. As promised in the first part of this article, a review of the inspection and maintenance practices followed in the American city referred to shall receive early publication in these columns.

Is the Tankless Holder Capable of Improvement?

As recently announced in the "Journal," the construction of three tankless holders is under way in this country—two for the Gas Light and Coke Company, and one for the Ipswich Gas Company. Whether these present, in design and method of working, the ultimate form of this type of holder, is open to doubt—doubt encouraged by certain experiences. Nevertheless tankless holders will stay, and have their place; but we are inclined to believe that engineering inventiveness will, by the introduction of new ideas, secure a definitely larger margin of safety in their operation. As a matter of fact, work is in hand with this in view.

In an article in our columns this week, Mr. Harald Nielsen states that he regards the tankless holder as one of the most interesting departures that have been made in gas-works plant. We agree with him; but his article reflects in every part the position that has been taken up in the "Journal"—that experience and investigation have revealed certain inherent weaknesses which require elimination to a degree which will remove all grounds for doubt. It is, in general terms, claimed that this has been done; but all our efforts to get the improvements specifically detailed for the consideration of our engineering readers, have been without reward. Those who alone can give the information are mum; they maintain a sphinx-like attitude. All they say is that the number of engineers who have adopted the tankless holder attests satisfaction, with the *ipse dixit* appended that all will be well structurally, in operation, in supervision, and in working cost, making comparison with the standards set by preceding types. Mr. Nielsen fully believes the tankless type of holder will have permanent residence among us; but he is of opinion that to ensure absolute safety, some radical changes will have to be introduced, though he sees nothing insuperable in them. He mentions some of the testimony to trouble he has encountered in his journeyings on the Continent, which does not leave Posen as an isolated instance of difficulty. He also points out that the new holder must be looked upon as a machine; but the mere fact that it is one must not be a deterrent. Most novel types of machines have their infantile troubles, which it is the work of the engineer to correct. Machines, however, usually involve attendance and supervision; and this storage and distributing machine makes claims in this direction which cost money. Some side-light is thrown upon this point in the article. Our contributor refers to the guarantee of no more than 2 p.ct. loss of gasholder volume per week. In one instance, the loss was found to be 2·6 p.ct. A calculation is made as to what this would be on a million c.ft. holder; and the result is that, calculating the loss at 2s. 6d. per 1000 c.ft., it would mean £169 a year, which represents 5 p.ct on an expenditure of £3380. There is

also the question of the cost of attendance—necessary for looking after the tar seals, pumping, and electric motors; there is the expenditure for power; and there is the specially prepared tar for the seals. It is idle to say that the constantly continuing cost of attendance and supervision is a negligible quantity as compared with other types of holders. It is admitted that it is possible now to obtain and maintain a correct viscosity of tar. It is necessary, however, to bear in mind that, where tar is employed, oxidation and polymerization will take place; and, furthermore, it is only natural that gas should take advantage of any openings to pass upwards. Structural matters, as well as the pressures likely to be encountered by the shell, are also referred to in the article; but, in respect of them, the problems associated with the realization of a fair margin of safety are, of course, capable of engineering solution.

However, the general conclusions at which Mr. Nielsen has arrived are that, though there has been remarkable freedom from accident having regard to the measure of adoption of tankless holders, the potential dangers are there. Despite this fact, he is convinced that the tankless holder is not a subject for suppression, but for improvement—improvement of a more radical order than has yet been proposed. It is more than probable that time will invest this type of holder with still greater interest.

Combined Gas and Electricity Supply at Retford.

THE Retford Corporation have furnished us with another example of electricity supply working in combination with a gas undertaking, and so helping to provide public services through an operating inter-relationship which cannot fail to produce economies of a mutually advantageous order. So far as accommodation of the generating plant is concerned, it has only meant utilizing part of the gas-works site, with for generation gas and waste heat supplied by the gas plant, and all the other established conditions of the gas undertaking brought to bear on the development of economy. This is being done under the direction of Mr. S. Oswald Pacey, M.Inst.Mech.E., whose title of General Manager and Engineer now incorporates electricity, in addition to gas and water. The new electricity plant was officially inaugurated on Monday of last week; and a description of it appears in this issue of the "JOURNAL." Both the generating and the distribution plant are on standard lines. Generation will be by gas-driven alternators (respectively 270 and 200 KW.). The gas-engines are of the "National" type—one four-cylinder, 400 H.P., and the other three-cylinder, 300 H.P. The foundations are also ready for a third set, when required. Perhaps the most interesting feature of the combination is that the light load will be taken care of by a steam-engine coupled to a 50-KW. alternator; and this set is supplied with steam generated, in a Spencer-Bonecourt boiler, by waste heat from the retort-settings. So far as we are aware, this is the first instance in this country of surplus waste heat from retort-settings being recovered and turned into electrical energy for public supply, though there is nothing new in the provision of power in that way for the internal purposes of a gas-works. A further opportunity for economy is provided by the previously existing small direct-current generating set which serves to meet the power requirements of the works. By the aid of a motor generator and transformer, the needs of the works can, if desired, be met from the new generating plant; while, on the other hand, the old generating plant can be used at periods of light load for town purposes, which will enable the new power station to be shut down completely for overhaul or alterations. There is no question that in the design of the scheme (the Consulting Engineers for which were Messrs. A. Hugh Seabrook & Partners), there has been a thorough investigation of the economies which can be effected, to the mutual advantage of the two undertakings, by joint operation. Retford has now its services for light, heat, and power concentrated at one place; and the choice of the agent for any one or all of those requirements rests absolutely with the customer. We congratulate all concerned on both the wisdom of the decision to combine the undertakings and the materialization of the project. What Retford has done is what ought to have been carried out in many other places. The conservation, by the co-ordination of the use, of our fuel resources would then have been better served. The Retford plant should afford some very interesting data later on, when a good load has been attained, and the operation of the plant has got into proper stride.

Treatment of Sulphate Effluents.

RIVER, fishery, and water-supply authorities are combining to press upon the Government the question of purifying from their deleterious constituents the effluents from manufacturing processes; and the matter is becoming more and more urgent. So far as the gas industry is concerned, it is not unmindful of its duty in this respect; but it is not prepared to take the blame for the discharge of obnoxious impurities which arise from other manufacturing quarters. The gas industry is taking up the investigation of its own effluents in a proper spirit. The subject was strongly pressed upon its attention by Dr. Lewis Bailey, in his annual reports as Chief Inspector under the Alkali Acts, supplemented by the activities of other interested bodies. The matter was brought under the consideration of the National Gas Council, who referred it to the Institution of Gas Engineers, who in turn appointed a Committee to make research into it, with the view of finding the most practicable method of rendering gas-works effluents harmless. Our columns have testified to the fact that there are several workers engaged in the experimental investigation of the subject; and, dealing with sulphate effluent, working-scale plants are in operation.

A recent paper on the question of effluents generally, and particularly from sulphate plants, was that of Mr. Edgar Jones, of Derby, before the Midland Junior Gas Association (see "JOURNAL," March 2, p. 516); and shortly we shall publish an abstract of a paper on the "Removal and Recovery of Phenols from Ammonia Sulphate Still Effluents," which Mr. D. W. Parkes, B.A., B.Sc., read last week before the Birmingham Section of the Society of Chemical Industry. That to deal with the effluent from sulphate plants is quantitatively not a small matter is shown by Mr. Parkes. By calculation, he arrives at an amount of 1500 million gallons to be disposed of annually; and, assuming an average tar acid content of 0·2 p.ct. (which is perhaps somewhat low), the total in the 1500 million gallons of waste liquor would be 3 million gallons. This indicates the magnitude of the problem which confronts those responsible for the cleanliness of our rivers and streams, and those responsible for the working of sewage disposal plants; and it also shows the enormous waste of material which has many uses in modern industry. However, taking the two papers together, without reference to any preceding published work, sufficient is found in them to show that good progress is being made in the development of methods of making gas-works effluents innocuous, but that it would not be safe immediately to pronounce upon any practical superiority on the part of any one. The question of sulphate effluent does not affect all gas-works; and those that it does will prefer to be definitely assured that a process is, all considerations taken into account, the best for adoption, before applying it, except experimentally, while matters are still in a more or less immature state.

In his paper, Mr. Jones deals first with the benzole method of removing phenols; and he regards this as a suitable method—the oxygen absorption figure of the effluent being in some cases reduced by approximately 20 p.ct. He also treats of the Fowler system, which cannot be operated without a large amount of ground area (which is not available in all works); and it requires the dilution of the effluent to a low figure for "oxygen absorbed," if the bacteria are to be kept in good fighting trim. Thirdly, he gives information as to Dr. Bailey's system for the treatment of effluents, which consists essentially in blowing flue gases, which are acidic in nature, through the liquor. With the working of this system, considerable success has been met with at the Hornsey and the Leamington Gas-Works. The system aims at the removal of phenoloid bodies from the liquor by simple treatment with boiler flue gases at from 90° to 95° C. Two methods have been tried—one with a tower, the

liquor being distributed from the top, and the flue gases injected by steam at the bottom. The other arrangement is for the flue gases to be injected into the effluent liquor in a trough, through which it is made to circulate—the liquor being kept at a temperature of about 90° C. The devil liquor is evaporated separately. The trough plan is the one with which Mr. R. S. Ramsden has been experimenting at Leamington. A table in the paper presents the combined effect of cyanide extractor and dephenolating trough in improving the character of the effluent from August, 1923, to November, 1926. Among the appended efficiency figures, based on the percentage of total entering, are these: Phenol, 53; thiocyanate, *nil;* thiosulphate, 28; other forms, 10. From the experience gained at Leamington, certain modifications are to be introduced, which, it is believed, will add to the efficiency of the apparatus. Another point in the paper is that the pretreatment of liquor can be made to pay its own expenses if the phenol content is sufficiently great; and nowadays in most liquors it is—especially in those from vertical retorts.

Opinions may differ from the recommendations of Mr. Jones in the concluding part of his paper. First, he suggests that the findings of the Alkali Inspector should be carried out with respect to the admission of air into the purifying system, which would result in the liquor on collection not containing so many oxidation compounds, so objectionable in effluents. Secondly, the liquor should be worked up as soon as possible after production, and be exposed to atmospheric oxygen as little as possible. Thirdly, the phenols should be removed by treatment of the liquor prior to distillation. Fourthly, after removal of the lime sludge, the effluent should be treated upon bacteria beds similar to those in use on sewage works. This would meet most cases where space is available, and would be less expensive than direct treatment on bacteria beds. The phenol recovery process should at least pay its way; and the load on the bacteria beds would be less. The running costs of the bacteria beds would be less, as, the effluent requiring less oxygen for treatment, less pumping for dilution would be necessary There is a strong feeling that, as gas undertakings contribute so heavily to the rates, sewage authorities should be prepared to treat sulphate effluents with the sewage.

The paper by Mr. Parkes is also highly instructive. He treats of the removal of the tar acids from liquor by activated carbon, and the recovery of the removed tar acids. The plan is being investigated both on a laboratory and on a semi-works scale. Briefly stated, the method of procedure is this: Saturating the waste liquor with carbon dioxide, a considerable amount of sludge is precipitated, and is allowed to settle out. The colour of the liquor changes from a deep brownish red to a pale yellow; the tar acid content remains practically unaltered; but a considerable amount of sulphuretted hydrogen is often evolved. The liquor is then brought into contact with the activated carbon, whereby the whole, or any desired proportion, of the phenols is removed. At the same time, there is a considerable reduction in the thiocyanate content, and a big drop in the oxygen absorption figure. When the carbon is saturated with phenols, it is distilled in a current of superheated steam, whereby 80 p.ct. of the tar acids absorbed can be recovered—chiefly in the form of liquid tar acids, and a saturated aqueous solution. The carbon is then ready for the treatment of a further quantity of liquor. The fact that the whole or any desired proportion of the tar acids can be removed is attractive, and an 80 p.ct. recovery from the carbon is also good. Mr. Parkes takes us (as will be seen when we publish the abstract of the paper) step by step through the various interesting experiments which have led to the present mode of procedure, and to the development of the recovery efficiency. Data are given applying to each series of experiments. Incidentally, the information is supplied that—based on small-scale experiments, and assuming the same results could be achieved on large-scale working—with a ton of carbon, liquor could be treated at the rate of 2700 gallons per hour. Using this in two ½-ton vessels, one would have to be distilled every two hours; but in practice it is likely the carbon would be divided into a number of vessels, and thus continue longer without the necessity of distilling. Another point is that a suitable standard of carbon must be used if good results are to be obtained. The activity of carbon made from low-temperature coke, activated in the laboratory, was not particularly high, and did not give results of special interest. Neither in connection with this process nor in the others is any indication made as to cost, other than that the recovery of the phenols should "defray at least part of the cost of purification" (Parkes); and "the phenol recovery process should at least pay its way" (Young).

A Windfall.

The Tynemouth Gas Company have good ground for being pleased that they took the advice tendered to them not to wait until the new Assessment Committee came into force under the Rating and Valuation Act of 1925, but to serve notice of objection against the current rate. The total assessment objected to amounted to £8027, net rateable value. It will be seen by a report in our "Miscellaneous News" columns that, as a result of the statements submitted to them, the Assessment Committee resolved to reduce the assessment to £5625, net rateable value; and the Company have decided to accept this assessment for the current rate, and serve a fresh notice of objection as soon as the new Assessment Committee under the 1925 Act come into office. In view of this result, the Company are entitled to a refund of upwards of £2000 in respect of the payment of rates for the period ending March 31. The Company are to be congratulated.

Company Law.

It is understood that the new Bill to amend the company laws will make its first appearance in the House of Lords almost immediately. It is stated that the measure will comprise some eighty clauses, which have been framed as a result of the work of the Committee who made exhaustive examination into the question. Most of the clauses will be found to be technical in character; but among the more general will be provision for dealing with the hawking of shares, so as to do something towards the protection of the public against the victimization which has resulted from the purchase by them of worthless shares.

Central Electricity Board.

The establishment of the Central Electricity Board is being completed as fast as possible. Some time ago we noticed, in the "Electricity Supply Memoranda," the appointment of the Chairman and members of the Board. Since then Mr. J. R. Brooke, formerly Permanent Secretary to the Ministry of Transport, has been selected as the Secretary, while Mr. D. W. Coates, of the firm of Messrs. D. W. Coates, West, Grimwood, & Co., Chartered Accountants, is to be the accountant. It has also been decided that the offices of the Board shall be at Trafalgar Buildings, 1, Charing Cross. It is understood that the members of the staff are already in occupation.

Trade Union Bill.

It is expected that the Bill to amend the law relating to trade unions will be in the hands of members of the House of Commons this week. The measure will contain no more than seven or eight clauses, and for all essential purposes may be said to be limited to the following four main points: (1) A statutory declaration of the illegality of general strikes and of the liability of organizations taking part in them to be sued for damages. (2) Prohibition of mass picketing, and of picketing of workers at their own homes. (3) A reversal of the system under which the political levy is at present enforced. The proposal is to substitute "contracting in" for "contracting out." (4) Refusal of permission to Civil Service organizations to affiliate with outside industrial or political bodies.

The Unemployed.

On the registers of employment exchanges in Great Britain on March 14, there were 1,118,700 names. This is 25,360 less than in the previous week, but 47,857 more than a year ago. The figures show that a steady decline in unemployment goes on week by week.

Trusts and Combinations.

The other day in the House of Commons, Mr. T. Henderson, who is a member of the Labour Party, submitted a motion urging that the Government should introduce legislation to provide effective public control over trusts and other large combinations. He made it clear that the Labour Party are not against trusts and combines whose aim it is to eliminate waste, and increase production; but the members of the party are strongly of the view that they should be subject to some form of control. There was assertion, on the part of the mover and seconder, that in connection with such trusts it was no use the workers trying to increase their production, because the trusts and combines could nullify all their efforts. Of course, the truth is that no trust or combine would do anything to nullify production by workers, inasmuch as to obtain greater efficiency and increased production, so as to realize greater economy, is the very object of amalgamating businesses in these days. It is overlooked by Labour members that large trusts and combinations exist in other countries, and their success in reducing the costs of production must be met by similar means in this country. Otherwise, we must go under in the markets of the world, and employment will be reduced. This fact alone is sufficient to protect the large amalgamations from any charge of undue profiteering. If they profiteer from such economies instead of using them to strengthen their competitive position, they will soon find themselves up against not only their competitors in other countries, but new competitors in our own. As Sir B. Chadwick, Parliamentary Secretary to the Board of Trade, stated, there has been no evidence of any marked abuse of their powers by business combinations in this country. The motion was defeated by a substantial majority.

EVENING STAR LODGE, No. 1719.

Installation Meeting.

The Evening Star Lodge, No. 1719, held its installation meeting of the year 1927 in the Grand Temple of Freemasons' Hall, Great Queen Street, London, on Wednesday last, the W.M., W. Bro. Alfred H. Henry, occupying the chair at the opening of the lodge, supported by the various officers. A large number of members and visiting brethren were present.

After preliminary business had been dealt with, feeling reference was made from the chair to the deaths of three members which had occurred since the previous meeting—viz., W. Bro. J. W. Broadhead, P.P.G.D. (West Yorks), of Elland; Bro. Samuel Carpenter, of Bridport (late of Dorking); and Bro. Daniel Irving, of Bristol. The sincere sympathy of the brethren was expressed in the traditional manner.

Bro. Frederick G. Cockey, S.W., who at the last meeting had been elected W.M. for the year 1927-28, was inducted to the chair by W. Bro. Henry, with W. Bro. Arthur E. Broadberry, P.M., L.R., acting as S.W., and W. Bro. E. G. Smithard as J.W. W. Bros. Arthur Valon, P.M., L.R., Arthur E. Croager, P.M., and Alfred C. Beal, P.M., also officiated in the ceremony of installation.

The investiture of W. Bro. Arthur E. Croager, P.M., as Treasurer for the year 1927-28 was duly carried out, and the other officers were appointed, those present being invested. The complete list of those called upon is as follows:

OFFICERS 1927-1928.

W.M.	Bro. Fred. G. Cockey.
I.P.M.	W.Bro. A. H. Henry, P.M.
S.W.	W.Bro. A. L. Croager.
J.W.	W.Bro. J. W. Foreman.
Chaplain	W.Bro. Charles Clare, P.M.
Treasurer	W.Bro. A. E. Croager, P.M., P.P.G.D. Kent.
Secretary	W.Bro. Rae P. Normand, P.M.
Dir. of Cer.	W.Bro. H. L. Sheppard, P.M.
S.D.	Bro. J. A. Brentnall.
J.D.	Bro. A. B. Potterton.
Organist	Bro. John F. Simmance.
I.G.	Bro. T. F. C. Potterton.
Stewards	W.Bro. R. W. Foster, L.R. Bro. W. H. Warren. Bro. W. F. Broadberry.
Tyler	W.Bro. R. H. Goddard.

W. Bro. Cockey, as newly-installed W.M., asked W. Bro. Henry's acceptance of a Past-Master's jewel, which had been voted to him in acknowledgment of the excellent services he had rendered the Lodge. On behalf of the three brethren whom W. Bro. Henry had initiated during his year of office, a Past-Master's collar and pendant jewel were presented to him.

Mr. Robert Grant, J.P., the Secretary of the Primitiva Gas Company of Buenos Aires, Ltd., was proposed as a candidate for initiation at a subsequent meeting.

After the concluding business had been regularly disposed of, the brethren proceeded to the adjoining Connaught Rooms for dinner. During the course of the evening the usual Loyal and other toasts were observed; the speeches being interspersed with some well-rendered musical selections.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

April 1.—BRITISH COMMERCIAL GAS ASSOCIATION.—North Wales, Cheshire, and Lancashire District Conference at Wallasey.

April 2.—MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.—Annual meeting and dinner at Parker's Restaurant, Manchester. Paper by Mr. A. McCulloch on "The Coking of Coal."

April 6.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the mantle works of Messrs. Lighting Trades, Ltd.

April 7.—MIDLAND JUNIOR GAS ASSOCIATION.—Meeting in Birmingham. Paper by Mr. F. Caudwell, of Shrewsbury.

April 8.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Spring meeting at Dumbarton. Inspection of the new gas-works.

April 9.—MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the Widnes Gas-Works.

April 9.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Annual meeting. Address by Mr. James McLeod.

April 12.—FEDERATION OF GAS EMPLOYERS.—Meeting.

April 12.—NATIONAL GAS COUNCIL.—Meeting.

April 22.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at the Westminster Technical Institute at 7.30. Paper by Mr. E. C. Holt entitled "Recent Improvements in Dry Meters."

April 23.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Huddersfield. Paper by Mr. B. Thorpe. Visit to the Huddersfield Gas-Works.

April 23.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Visit to the Dundee Gas-Works.

April 23.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Visit to the Kirkcaldy Gas-Works.

April 30.—WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.—Annual meeting at Newport.

April 30.—MIDLAND JUNIOR GAS ASSOCIATION.—Visit to the Foleshill Works of the Coventry Gas Department.

May 4.—MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION. Visit to the Donnington Works of Messrs. C. & W. Walker, Ltd.

May 5.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Spring meeting at Ipswich.

May 5.—NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.—Annual meeting at Newcastle.

May 6.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Annual business meeting at the Westminster Technical Institute at 7.30.

May 12.—MIDLAND JUNIOR GAS ASSOCIATION.—Annual meeting.

May 19.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.—Meeting at Abergavenny.

May 20.—BRITISH COMMERCIAL GAS ASSOCIATION.—Manchester District Conference at Buxton.

May 21.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Visit to the Keighley Gas-Works.

May 21.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Annual meeting in Edinburgh. Presidential address of Mr. M. Darling, of Cowdenbeath.

May 26.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Spring meeting at Dudley.

May 26.—SOCIETY OF BRITISH GAS INDUSTRIES.—Annual general meeting and dinner, at the Hotel Cecil.

June 11.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the Margate Works of the Isle of Thanet Gas Light and Coke Company.

July 12.—NATIONAL GAS COUNCIL.—Annual meeting.

INSTITUTION OF GAS ENGINEERS.

April 11.—Council meeting.

June 14-17.—Annual General Meeting in London.

German Gas Association.—It is announced in "Das Gas- und Wasserfach" that the Annual General Meeting of the Association—the sixty-eighth of the series—will be held this year at Cassel, on June 15 to 17 inclusive. Details of the programme are not yet available, but will be sent out at a later date with the invitations to members.

PERSONAL.

Mr. T. Anthony Canning, F.C.S., Assistant Engineer and Manager to the County Borough of Dewsbury Gas Department, under Mr. Henry L. Bateman, Engineer and Manager, has been successful in obtaining the post of Assistant Manager to the Woking District Gas Company, under Mr. William H. Ely, the Engineer and Manager. Mr. Canning received his early training with his father, Mr. J. Herbert Canning, Engineer and Manager to the Newport (Mon.) Gas Company, and before the completion of his pupilage was appointed Junior Assistant to the Company. He afterwards became Technical Assistant Engineer, relinquishing that post to take up the position of Assistant at Dewsbury early in 1926. Mr. Canning has taken a great interest in the Junior Gas Associations; being a foundation member and Past-President of the Wales and Monmouthshire Junior Gas Association, and a member of the Yorkshire Junior Gas Association. He is also a member of the Wales and Monmouthshire District Institution of Gas Engineers and Managers, and an associate member of the Institution of Gas Engineers. He has read several papers before various gas associations.

We are very sorry to learn that Mr. Edwin Upton, who followed Col. J. F. Robinson in January, 1911, as Treasurer of the Liverpool Gas Company, and who has recently been in indifferent health, has found it necessary to retire from that position. His services are, however, being retained by the Company in a consultative capacity. Mr. Upton was the Borough Accountant of Bootle for ten years before securing his appointment with the Gas Company, and had been in the service of the Bootle Corporation from boyhood. The Directors have appointed Mr. J. Sandon Stubbs as Treasurer to the Company; and Mr. T. J. Burns succeeds Mr. Stubbs as Chief Clerk. Mr. Stubbs has spent the whole of his business career with the Company, having entered their service as a junior clerk thirty-four years ago. It is to be hoped that, with release from the cares of office, Mr. Upton's health may be restored.

Mr. Reginald G. Clarry, Member of Parliament for the Borough of Newport (Mon.) and Vice-President of the Gas Companies' Protection Association, was initiated into Freemasonry in the Aldersgate Lodge, No. 1657, at the Hotel Cecil on the 21st inst. by W. Bro. F. E. Cooper, P.M., P.Z., L.R., Secretary of the Gas Companies' Protection Association.

Last week a presentation took place to Capt. W. J. Liberty (late Chief Superintendent of Public Lighting to the Corporation of the City of London) by his colleagues to mark their appreciation of his half-century of official life, during which he occupied the above position first to the City Commissioners of Sewers, and afterwards under the Public Health Department to the Corporation on their absorption of the former body, in 1898. In the absence of the City Engineer, who was to have made the presentation, Mr. W. P. Bicknell, the Principal Clerk to the Public Health Department, performed the function, and handed to Capt. Liberty a handsome water colour picture of Mill Torr, Devon, by Widgery. Mr. Bicknell reviewed Capt. Liberty's career at the Guildhall, from the beginning of 1880 onwards. He referred to his efforts in starting the London and Southern District Junior Gas Association, of which he was twice President, to his many contributions on the historical and scientific aspects of public lighting, to the awards and premiums he had received for them, and to his efforts in assisting in the formation of the Institution of Public Lighting Engineers, of which he had been honoured by being elected Hon. Secretary. Mr. Bicknell also referred to the many years of experimental work in the City of London with all forms of public lighting, both gas and electricity, particularly in respect of the present splendid lighting of the city with centrally-suspended lamps, which had made the City of London one of the best lighted cities in the whole world. Capt. Liberty had the supervision of the whole of this work, and so arranged and spaced the lighting, in collaboration with the contractors, that there had been a saving to the ratepayers of £7000 per annum since 1913, with an increase of 100 p.ct. in the illumination. Capt. Liberty responded.

Mr. Henry Thomas Tizard, C.B., A.F.C., F.R.S., has been appointed by His Majesty the King in Council to be Secretary to the Committee of the Privy Council for Scientific and Industrial Research, on the retirement of Sir H. Frank Heath, K.C.B., from that office on June 1 next.

OBITUARY.

We regret to announce the death of the Rt. Hon. T. McKinnon Wood, at his residence, 24, Queen's Gate, on Saturday morning, the 26th inst., after an illness extending over three months. Mr. Wood was one of the original Directors of Thomas Glover & Co., Ltd., gas meter manufacturers, and joined the Board of R. & A. Main, Ltd., gas stove manufacturers, and Glover & Main, Ltd., in 1897, when these Companies were amalgamated under the title of Glover & Main, Ltd. When he took office under Mr. Asquith's Government in 1908, he resigned his Directorships. He rejoined the Board in 1911, and again resigned in 1913, owing to pressure of business under the Government. Shortly after the death of the former Chairman, Mr. Robert Baillie Main, in 1918, Mr. Wood once more became a Director, and was appointed Chairman of the three allied Companies—a post which he held until the time of his death. Mr. Wood devoted unceasing attention to the affairs of the Companies; and in all matters of business and finance his advice has been invaluable. His loss will be keenly felt by his colleagues.

The death has occurred of Mr. Frank Lomas, who for nine years was Chairman of the Bakewell Gas Company.

ELECTRICITY SUPPLY MEMORANDA.

The Two-Part Tariff.

The two-part tariff is forging ahead in the electricity supply industry, for the reasons that in domestic service it does away with duplicate wiring and meters, ensures that (through the primary charge) all consumers pay their proportion of standing costs, and that the secondary low price per unit encourages the greater use of current for purposes other than lighting. Writing in the "Electrical Review" for March 18, Mr. Cyril J. Crawshaw, B.Sc., states that he is convinced the price of electricity is the biggest factor in deciding the rate of increase in domestic electrification; and systematic reduction in the price based on the previous six to twelve months' working—widely advertised—would be the best way of bringing in new consumers, and encouraging an extended use of current by old ones. Those are the arguments which have been put forward in the gas industry for the adoption of the same method of charging. Mr. Crawshaw urges that the two-part tariff should be adopted by electricity undertakings throughout the country; and he goes so far as to submit that it should be the only tariff as far as domestic supply is concerned. We have no ground for criticizing his contention, in support of which he puts forward the following considerations: (1) Having regard to the complex nature of the subject, he submits that the two-part system is simple, and is the only tariff that is fair, or can be made so, to both consumer and supply undertaking. (2) By means of rebates on KW. connected and type of load, the tariff lends itself readily to preferences for large consumers, and those who by various devices improve the load factor. (3) The standing charge and the price per unit could be, and should be, revised for a year, or for that matter for six months, bearing in mind not only the number of new consumers connected, but the capital charges involved in the new extensions. We are afraid that the third contention—as to the short-period revision of the standing charge and the price per unit—would not apply very well in the case of companies working under a sliding-scale of price and dividend. Of course, it would not be difficult to revise the secondary price. But reductions every six months would, in present circumstances, soon bring gas and electricity undertakings to the end of their tether; and the latter are in a bit of a quandary as to the outcome of the scheme upon which the Central Electricity Board are now at work.

Assisted Wiring, Southport.

The assisted wiring policy is extending in the electricity industry. From cases which have recently been published, we may refer to two examples. At Southport, the Electrical Engineer has submitted a report, in which he recommends that the system should be put into practice without delay. He desires that it should only apply to the wiring of residential property where distributing cables are at present available; and he unkindly suggests that it should be confined to property at present using gas, but not to new houses. He also apparently wishes to debar any householder whose premises are wired under the scheme from any other form of lighting therein, seeing that one of his conditions is that any house wired under the scheme should have "a complete electric lighting installation throughout," with a maximum of twelve lighting points. No lamp shades or fittings would be provided. The installations would be carried out to the specification of the Electricity Committee, at a price per point as agreed with the local contractors. The terms of purchase by the tenant would be: The cost of the installation, *plus* 10 p.ct., together with the net cost of the service cable, to be charged 20 p.ct. down before the work commences, the balance, *plus* 6 p.ct. per annum, to be paid in equal quarterly instalments for periods of one, two, or three years at the consumer's option. Another condition, which it is proposed should apply, is that a special agreement should be entered into with the landlord and tenant in each case, providing that where the latter leaves be-

fore completing the purchase of the installation, he must either pay all outstanding balances, or arrange to transfer his future commitments to the landlord or incoming tenant. Repairs due to faulty workmanship and material would be executed free of charge for the first twelve months after connection; and thereafter any repairs must be carried out at the consumer's cost. The scheme should be extended to include wiring and plugs for operating domestic appliances on similar lines to the lighting installation. The estimate of the average cost per lighting installation is from £12 to £14. Assuming that 100 installations are carried out per annum, the cost to the Department would be somewhere about £1000 per annum.

At Cardiff.

The second illustration is from Cardiff. The Corporation Finance Committee have been considering the proposal of the Electricity Committee to set aside £20,000 towards the cost of bringing into operation an assisted wiring scheme, which would include the wiring of houses and the installation of the necessary fittings for lighting and heating, with the cost spread over a number of years. The Chairman of the Electricity Committee (Mr. A. E. Gough) informed the Finance Committee that there are some 40,000 houses in the city, of which at least 30,000 do not use electricity. He believes that the principal reason for this is that neither landlords nor tenants will face the initial cost of installation. It has been estimated that orders would be received for the wiring of at least 2000 houses under the proposed scheme; and as it is not intended that the scheme should apply to houses with more than seven lights, the average cost of installation is placed at £10 per house. Instead of charging the consumers 4½d. per unit, they would, under the scheme, be charged 8d. per unit, until the difference in the unit charge had wiped-out the installation costs. The City Treasurer made a request for fuller details; and therefore the Finance Committee referred the matter back to the Electricity Committee, in order that, for their edification, they might prepare a complete scheme.

Demonstration Houses.

The official period of the campaign for the Wiring of British Homes comes to an end with the close of this month. One of its outstanding features has been that, in the quarters where it obtained adoption, there has been a large experience of the attractiveness to the public of demonstration houses. Additional ones have been opened in several centres; and there has been some talk in various places of making a more or less permanent institution of such houses. But even demonstration houses, although they may have a good effect temporarily, lose interest for the public, and become almost worthless other than for enabling prospective customers to see equipment fitted up and in use under more or less normal conditions. The current enthusiasm over such houses is due to the large number of people who have visited them, as people will always visit in good numbers a free show, although this affords no criterion as to actual business gain. Of course, the running of such houses costs money; and as public attention dwindles, the question arises whether to continue the game is worth the candle. In other districts the houses have only remained open for the period originally arranged.

L.C.C. and Electric Cooking.

If the throwing of heavy bricks could do injury to the members of the Education Committee of the London County Council, they all ought to be suffering severely after the strictures cast upon them and their intelligence by "Hotspot," the writer of "Cooking and Heating Notes" in the "Electrical Times." In the "Memoranda" for March 2 (p. 507), we gave, *literatim*, a report of the Committee on the teaching of electric cooking at the domestic economy centres of the Council. "Hotspot" does the same in the issue of our contemporary for March 17. In his comments upon the findings, he states: "The report itself is precisely the illogical summarization one would expect from an ultra conservative body gradually being convinced against its will of something it does not wish to believe." After reading that, and recovering their breath, the members of the Committee will probably feel very hurt. "Hotspot" looks at the matter in this way: "The Education Committee state, in effect, electric cooking is as good as gas cooking and as cheap; but it is new, and to-day is not so widely used as gas cooking. The only system of cooking the housewife of the future needs to know of, therefore, is the one her mother used before her. Progress may come, but let it not be in our time, please Providence." Electric cooking is not new; it has been with us for decades. Since electric cookers first came on the market, the adoption of gas cookers has made greater strides than ever. The country has in use millions of them; and those were the instruments that saved the situation during the long coal stoppage of last year, in a manner with which it would have been impossible for the electricity industry to cope, without enormous preliminary capital expenditure for generation plant and cables for the short-time service needed in the preparation of food. That is not the sort of expenditure and business which serves the best interests of electricity. "Hotspot" may know much about the process of electric cooking, but certainly he does not know a great deal of the advances which have been made in the gas cooker, or he would not have referred to the housewife of the future using the same form of cooker as her mother used before her. Those are not his precise words, but that is what he meant. There has been progress in gas cookers just as much as, or more than, there has been in electric cookers; and what is more, the gas cooker is a more economical appliance to construct and use, with a greater range of utility and reliability. Our journalistic friend has apparently overlooked this very definite statement in the report of the Committee: "We are of opinion, in view of the information we have had before us, that unless and until the time comes when cooking by electricity is proved to be definitely more economical than cooking by gas, giving rise to a widespread desire on the part of housewives for electrical equipment in preference to gas, no special case exists for the general introduction of electric cooking into the Council's domestic economy centres." Nor does he comment on the fact that this conclusion has been arrived at after the matter has been under the consideration of the Committee for nearly four years, and the cooking experiments, at four centres under four different staffs of experts, have been proceeding for something like two years. If that is not a satisfactory test, and one upon which a Committee could come to a definite conclusion, then we do not know what would satisfy our electrical friend.

Accumulated Profits and the Rates.

The Cardiff ratepayers have had a windfall. Some of the members of the Finance Committee, being under the impression that the accumulated electricity reserves would pass out of the control of the Corporation with the advent of the new Central Electricity Board, have been moving the City Council to relieve the electricity undertaking of £80,000 of its accumulated profits, and to transfer the sum to the credit of the local rates. To this, it appears, the City Council have agreed. Alderman Sir Illtyd Thomas is concerned as to the legality of the transfer; and at a recent meeting he asked that the Finance Committee should give further consideration to the question. According to Sir Illtyd, one of the Electricity Commissioners looks upon the Council's action as a piece of sharp practice. Apparently the Finance Committee are not inclined to have anything more to do with the matter, for Alderman F. H. Turnbull, the Chairman of that Committee, stated that the question had passed out of their hands entirely, in view of the fact that the Council had confirmed the resolution. To this Sir Illtyd replied: "It would be a bombshell if we had to repay £80,000." Alderman Turnbull replied that £70,000 of the £80,000 had been earned in a period of years prior to last March—long before the Commissioners had been heard of; and the only thing that body could complain of would be the use of profits made since the passing of the Electricity Supply Act of 1926. He clinched the matter with the remark: "Let them all come, we can deal with them at the proper time if they do." This bellicose attitude may have a retarding effect upon the Commissioners, if they have any idea of interfering, which is doubtful, seeing that they have no power over the accumulated funds of any undertaking. Our view is that the transfer in aid of the rates of the sum in question is based on a huge mistake.

London Statistics.

In the report of the Highways Committee of the London County Council, presented at the meeting of the latter recently, is a reference to the statistics and accounts of electricity supply authorities within the London and Home Counties electricity district for the year 1924-25. The district covers 1797 square miles, and embraces a population exceeding eight millions. In it there are 89 authorized distributors of electricity—viz., 44 local authorities, and 45 companies. The units sold during 1924-25 numbered 964,924,072—an increase of 14·2 p.ct. over the figures for the previous year. The revenue from the sale of current amounted to £10,713,154—an increase of 7·2 p.ct. The generating plant capacity at the end of the year was 843,517 KW.—an increase of 11·7 p.ct. The net capital expenditure amounted to £48,201,346—an increase of 9·1 p.ct. Comparing 1901-2 with 1924-25, it is seen that the net capital expenditure of both local authorities and companies was in the former year £11,722,298; in the latter, £35,370,851. The capacity of the generating plant was 110,843 KW. in 1901-2; 637,902 KW. in 1924-25. The number of units sold in 1901-2 was 79,472,110; and in 1924-25 697,219,486. This latter figure allows for sales between local authorities and companies; up to 1912 such inter sales were small in amount. The average load factor based on a maximum load on feeders and units sold was for local authorities in 1901-2, 15·7 p.ct.; and in 1924-25, 22·8 p.ct. For the companies in 1901-2, 13·3 p.ct.; and in 1924-25, 20·5 p.ct.

ELECTRICITY SUPPLY FROM THE RETFORD GAS-WORKS.

Gas and Electricity under Joint Management.

An electricity undertaking at a gas-works, generating its current from gas, and utilizing the waste heat from the retort house.

The opening ceremony of electricity generating plant which is installed at the Retford Gas-Works, took place on March 21. The generators are driven by gas engines drawing their supply of gas direct from the holders. Alderman W. N. Brackett, J.P., is the Chairman of the Electricity Committee; and Mr. S. Oswald Pacey, M.I.Mech.E., late of Doncaster and Santos, is the General Manager and Engineer of the Gas, Water, and Electricity Departments. The Consulting Engineers to the Electricity Committee are Messrs. A. Hugh Seabrook & Partners.

Electricity supply has been discussed in Retford since 1904, when Mr. A. B. Mountain made a report to the Council; but for various reasons it was not considered advisable to proceed with the work. It was not until 1922, when Mr. A. Hugh Seabrook was instructed to make a report on the prospects and cost of an electricity undertaking, that any definite move was made. A Special Order was applied for in 1924, and duly confirmed by Parliament on Dec. 20 of that year. After considerable negotiations with regard to bulk supplies, the Electricity Commissioners sanctioned the construction of a station.

Description of the Scheme.

The system employed is standard in every way—generation at 6600 volts three-phase alternating current, 50 periods; distribution by means of 4-core cable, 400 volts across phases and 230 phase to neutral. The main contractors for the generating station were the Electric Construction Company, Ltd., of Wolverhampton, and the sub-contractors for the gas engines were the National Gas Engine Company, Ltd., of Ashton-under-Lyne.

50-K.V.A. Bellis & Morcom steam set, with Foster transformer on left hand.

The generating plant is all on standard lines. The E.H.T. switchboard consists of truck type panels, and the auxiliary plant is both engine and motor driven; there being in each case a stand-by for the starting gear and circulating water pumping. The cooling tower and accessories were manufactured and supplied by the Visco Engineering Company, of Grosvenor Road, S.W. 1. The engines are of the latest type, manufactured by the National Gas Engine Company, and designed for operating on town gas. The generating plant consists of two gas engine driven alternators—one 270 kw. and one 200 kw. capacity. Foundations are prepared for a third and larger set. The light load will be taken care of by a Bellis & Morcom condensing steam engine of 50 kw. capacity; and this set is supplied with steam by a waste-heat boiler constructed by Messrs. Spencer Bonecourt, Ltd., of Westminster. The boiler is arranged to take the waste gases from the retort house. Though surplus heat is being recovered and formed into electrical energy in many gas-works, the power so produced is used mainly for gas-works purposes; and it is believed that Retford is the first case where gas-works surplus heat has been converted to electricity for supply to the town.

The gas-works have had for some time past a small direct-current generating set for operating the retort charging apparatus and for other power requirements about the works; and by means of a motor generator and transformer, this power can be supplied from the new generating station, or at periods of light load the small gas-works generating set can supply the town, enabling the new power station to be shut-down completely for overhaul or alterations. The engine room is fitted with a 10-ton overhead travelling crane, manufactured and supplied by Messrs. Herbert Morris, Ltd., of Loughborough.

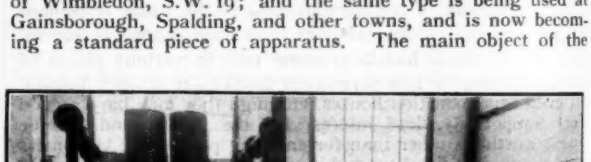
Foundations for the Plant.

The foundations for the plant caused considerable difficulty, owing to running sand being found a few yards away when excavating for extensions of the gas-works. It was consequently deemed advisable to employ the Francois Cementation process for converting the unstable sand and gravel into solid concrete. This work consisted of piles cast *in situ* at an average depth of 22 ft.; this being the point at which a good sandstone bed was found. Eleven piles were cast for the 300-h.p. engine, 13 for the 400-h.p. engine, and a further 15 piles were left in position for extensions when necessary. The concrete engine foundations on top of the piles weigh approximately 150 and 200 tons respectively. Apart from the piling done under the tower scrubber at the gas-works, this is the first example in England of casting piles *in situ* under the Francois patents. The work was carried out expeditiously by the contractors. Commencing on July 22, 1926, they handed over the completed foundations by Oct. 19, which, in view of the difficult task, was highly satisfactory. The house foundations by the same firm were finished by Nov. 22. In view of the fact that current for commercial purposes was available on Feb. 28 of this year, it will be noted that the actual time taken for the erection of the power station was only a few days over three calendar months. Messrs. R. Dempster & Sons, of Elland, are responsible for the building, which consists of a plain steel framing and brick filling.

Cables and Transformers.

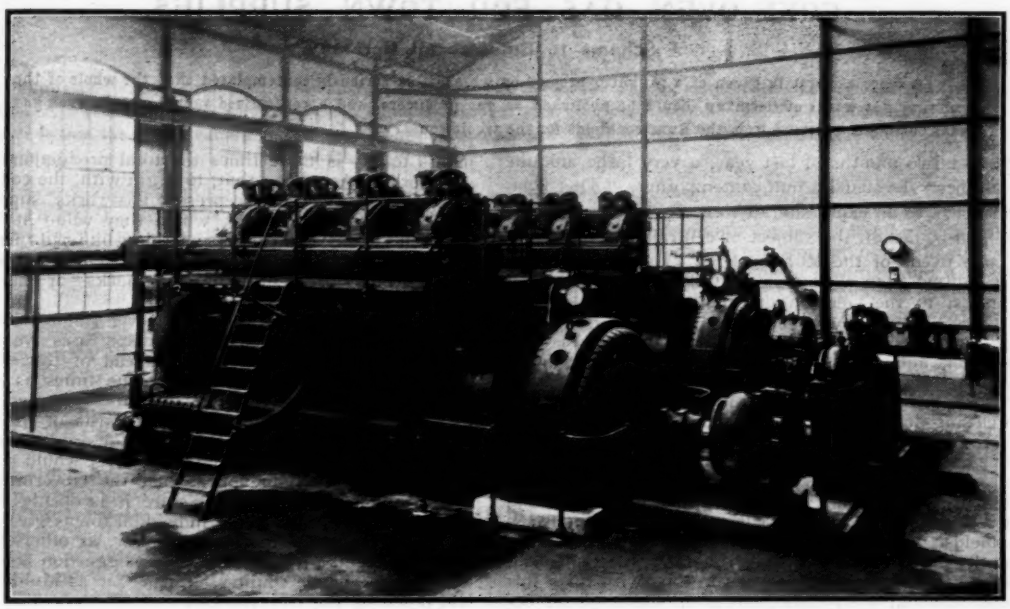
The E.H.T. and L.T. cables were manufactured and supplied by the Pirelli-General Cable Works, Ltd., of Southampton. The laying and jointing were supervised by them, but excavation and reinstatement were carried out directly by Mr. Pacey. The cables are standard in every respect; being paper insulated, lead sheathed, steel tape armoured, and laid direct in the ground.

The transformers possess several novel features. They were specially designed by the Foster Engineering Company, Ltd., of Wimbledon, S.W. 19; and the same type is being used at Gainsborough, Spalding, and other towns, and is now becoming a standard piece of apparatus. The main object of the design was first of all to reduce the transformer equipment cost, and, secondly, to obtain a transforming apparatus that would provide complete control of the low-pressure supply in its neighbourhood, without reference to the bulk supply or generating station pressure.



Mather & Platt water circulating pumps, with National air compressors on right-hand side. Compressed air tanks at back.

To effect the first result—viz., economy—no building or site is required, and not even a kiosk in which to house the transformer. The transformer tank itself is stronger than the usual design, enabling it to be stood by the roadside, or in any other suitable position, on a small concrete platform, completely exposed to all weather conditions. One advantage of this is that, in the case of changing, or necessity for removing the transformer from any cause, it does not have to be taken out of a building or kiosk, but merely unbolted from its cable column, and rolled away on its own rollers, and another transformer rolled into its place. Incidentally the single enclosure—viz., the tank, as compared with the invariably used double enclosure of either steel or brick, combined with exposure to the atmosphere—enables the transformer to run cooler, and consequently more efficiently. The tank and transformer are so



4-CYLINDER 400-B.H.P. NATIONAL GAS ENGINE DIRECT COUPLED TO 270-K.V.A. ELECTRIC CONSTRUCTION COMPANY ALTERNATOR.

constructed that there are no external fittings that might be interfered with, and cause danger to the general public.

CONTROL OF THE L.T. SYSTEM.

The second object—viz., control of the L.T. system—is obtained by a chamber immediately over the transformer and in the same tank, containing a tapping switch on each phase that can be operated under load. There is an ammeter in each phase and a voltmeter that can be connected to any phase, and there is also a portable lamp and length of flexible cable. With this apparatus the mains foreman can see at once what load he is getting on his phases, and the pressure between phase and neutral; and he can control the distribution pressure independently of the generating station or feeder pressure. This has obvious advantages in itself, but it has a further advantage which cannot be easily converted into £ s. d. This advantage is that the E.H.T. cables, contrary to the usual practice, can be "squeezed," as it were, to a greater extent than is possible where transformer ratios are rigid. On a low load factor which such towns as Retford are likely to reach, it is important from a feeder and distribution cost point of view to be able to run the cables at a high capacity for the few hours a year that the maximum demand is required. This cannot be done where fixed transformer ratios are in use, owing to the serious volt drop on consumers' premises. This type of transforming apparatus, therefore, enables smaller cables to be employed than would otherwise be the case; and the expense of increasing cable capacity can be deferred until its maximum carrying capacity has been reached, because the equipment is to a certain extent independent of pressure drop.

The Corporation intend to put into force, and have received loan sanction for, the hire and hire-purchase of installations, apparatus, motors, and so on; and already a considerable load has been connected to the mains. Electric power will probably be used to a great extent during the next twelve months for water and sewage pumping.

There was a large gathering of public representatives from neighbouring towns at the inauguration ceremony on March 21. Alderman BRACKETT, on behalf of the Retford Corporation, extended a hearty welcome to the assembly. He said they felt very proud of the new power station.

The MAYOR (Councillor J. W. Iremonger) then switched-on the new engines.

At the close of the inspection of the new plant, Mr. H. N. BICKERTON, on behalf of the contractors, presented the Mayor with a gold cigarette case.

LUNCHEON IN THE COUNCIL CHAMBER.

At a subsequent luncheon the toast of "The Mayor" was proposed by Mr. F. PEGLER, and following the reply,

Viscount GALWAY proposed "The Retford Electricity Undertaking." He said that a deep debt of gratitude was due to those who had worked hard to bring about the establishment of the electricity undertaking.

Mr. A. HUGH SEABROOK, in supporting the toast, referred to the electrical scheme at Marlborough, a town with a population of 3000, and said the undertaking was remunerative from the first year, and he saw no reason why it should not be so at Retford. Mr. Pacey, the Electrical Engineer, had done more than supervision during the construction of the works; and this had avoided the expense to the Corporation of a clerk of works. There were one or two unique features about the works. The question had been asked what would happen if the Central Board decided that the works should be shut down, and a bulk supply taken from a company. He could assure everybody that, supposing a bulk supply was available to-morrow, not a penny expenditure would be incurred on the plant.

The CHAIRMAN, in his reply, said he hoped that in due course the streets would be lighted by electricity. The undertaking was now in need of consumers.

Alderman A. P. WILLIAMSON, Vice-Chairman of the Electricity Committee, proposed "The Contractors," congratulating them on the excellent work they had carried out.

Mr. H. N. BICKERTON, of the National Gas Engine Company, in reply, said that Mr. W. Furness, Managing Director of the Electrical Construction Company, joined him in returning thanks. Retford had a complete installation. It was pleasing to know the contractors had given satisfaction; but this was largely due to the assistance they had received from Mr. Seabrook and his colleagues, Mr. Pacey, and his predecessor, Mr. Bradshaw. He referred to his association with the gas engine industry for half-a-century, and said the Retford Corporation were to be congratulated upon having the two best of the four great essentials in any civilized community. He felt confident that as time went on they would blend together. Each, used in its own sphere, would benefit all. Most of the electrical undertakings were a financial success, and he saw no reason why it should not be the same at Retford.

Economic Use of Coke Oven Gas.

In his presidential address before the Institution of Chemical Engineers on March 11, Sir Frederic Nathan said that every day the importance of hydrogen, pure or even slightly impure, in chemical manufacture became more and more obvious. One of the biggest problems in front of the chemical engineer was that of making hydrogen at a low cost; and coke oven gas supplied him with an important starting point for his investigations. Liquefaction of gas on a large scale for the purpose of separating its constituents was receiving the close attention of engineers, and required even closer attention by chemical engineers than it had hitherto received except in a few efficient and specialized works. But liquefaction was not the only possible means of separating the constituents of coke oven gas, and thus of obtaining hydrogen from it. The possibility of such methods as centrifuging or selective solubility under pressure could by [illegible]ns be excluded. The use of hydrogen obtained from [illegible]ven gas had been considered hitherto mainly from the po[illegible] view of the manufacture of synthetic ammonia; and it would not be out of place to draw attention to the fact that nearly all plants designed for the manufacture of this product as a bye-product from coke oven gas were of foreign origin. The newer developments of the production of synthetic solvents and combustible liquids from mixtures of carbon monoxide and hydrogen, and of the possibility of the hydrogenation of coal, already referred to, offered nearly virgin fields of development compared with the manufacture of synthetic ammonia, and gave rise to possibilities for the use of coke oven gas at present wasted. It was certain that these new processes could only be developed commercially if the hydrogen required could be produced at a considerably cheaper rate than that associated with present methods.

COKE-OVEN GAS FOR TOWN SUPPLIES.

A Scheme to Embrace all Germany.

[A short account is given of a gigantic project by which it is seriously contemplated that the whole of the existing gas-works of Germany should be abolished as gas producers, and a centralized supply of coke-oven gas sent out under pressure from the Ruhr coalfields for the whole country.]

Since the last two months of last year, a very large amount of space has been devoted by our contemporary, "Das Gas- und Wasserfach," to an expression of views by various eminent individuals and bodies on the subject of centralized gas supply from the coke ovens of the Ruhr district. The question has recently crystallized from a general topic into a definite project of vital interest to the German gas industry. A convenient summary of the situation and commentary by Herr Rosskothen, of Salzburg, appeared recently in the Journal of the Austrian Gas Association, and was reprinted in the February Bulletin of the Swiss Association.

The proposal involves no less a matter than the gradual successive closing-down of the whole of the gas-works of Germany, and the supplying of gas from coke ovens instead. The quantity of gas already supplied from this source in Germany amounts to 300 million cub.m. [10,600 million c.ft.], or approximately one-tenth of the whole gas consumption of the country. At present it is confined to the districts within reasonable reach of the coalfields. But a syndicate recently formed, with the backing of the all-powerful coal and iron interests, under the title Aktiengesellschaft für Kohlenverwertung, with an "initial" capital of about £1,250,000, has aims which go far beyond this, and which might well be described as gigantic.

The authors of this scheme for the abolition of the existing German gas industry put forward figures by which they claim to show that, in the twelve years from 1910 to 1922, the cheaper gas in towns supplied from coke ovens induced an increase of 130 p.ct. in consumption, against only 35 p.ct. in those which maintained their own gas-works. From their own point of view the case is clear. To them gas is a bye-product, and, failing a market for it, they consume it for the heating of their own ovens. For this purpose they value the cubic metre of gas of 4500 B.Th.U. net as the equivalent of one kilogramme of coal, for which they debit their ovens at the rate of Mk.12 a ton. This is equivalent to valuing 1000 c.ft. of 500 B.Th.U. gas as the equal of 62 lbs. of coal, and as worth about 4d.

In addition to this, the problem of small coal would be solved for the producers. This amounts to some 50 p.ct. of the total coal output, and in normal times much of it is unsaleable. It consequently accumulates in the pit-heaps, and suffers natural deterioration especially affecting the coking property. If the collieries could sell their gas, they would be in a position to use up this small coal, as well as surplus coke.

Finally, the coal-owning proposers of this gigantic scheme profess to regard it as little less than a scandal, from the national economic point of view, that millions of capital should remain tied up in large and small gas undertakings for the manufacture of a product which is available in superabundance in the colliery districts. They claim that their coke-oven gas could be piped quite simply to all parts of the land, and at much lower cost than is paid in coal freightage at the present time. They further claim that the surplus gas from the colliery plants to-day is three times the total production from all the gas-works. Assuming that, to begin with, the coke ovens take over only one-third of the present gas-works' supply, and that they sell the cubic metre, which they value at 1·2 pfennig, at 1·2 + 1 = 2·2 pfennig [something like 7½d. per 1000 c.ft.], the additional 1 pfennig [less than one-tenth of a penny] would mean a gross profit of 10 million marks—or capitalized at 10 p.ct., an amount of £5,000,000.

The authors of the project, however [almost in the style of some of the choicest company prospectuses we have seen—Ed. "G.J."], have visions far ahead of this. The present coke-oven gas surplus is already nine times as great as the output in the above estimate. Add the increased demand due to the cheaper selling price, on the basis of the 130 p.ct. in twelve years already mentioned, and the economy to the nation [apart from the profit to the promoters!] would reach staggering figures. It would appear that the Government is really interesting itself in the idea, since it is openly stated by the promoters that "the sooner individual towns give their earnest consideration to the matter the better, as otherwise the State will have to take it in hand;" one suggestion being that pipe-lines for the whole country, even as far as Munich, should be laid down by the Government.

Two points of importance strike the writer as having been omitted from the voluminous contributions to the discussion of the subject in the Press. First, there would have to be considered the loss to the State Railways if no more coal had to be taken to gas-works. Even allowing for extra freights on coke to places which no longer produced their own requirements, he estimates that the revenue loss would be not less than Mk.30 million. Some form of additional taxation would be required to replace this, such, for instance, as way-leave rents on the high-pressure mains under streets. Another vital question would be the possibility of strikes in the coalfields. The nation's gas supply would be more than ever at their mercy if it was all centralized at the pitheads.

This account gives a brief insight into what at first might appear the imaginary product of a dreamer's brain. That it is far more than this, and that it is regarded as a real threat to the very existence of the gas industry in Germany, is clear from the seriousness with which the latter's champions, and Ernst Körting among the foremost, have taken up its defence. In a letter of his which we reproduced in our issue of Dec. 15 last, and upon which we commented in the succeeding issue, he made some reference to the subject. In the columns of our German contemporary, he and others have dealt very fully with the many problems which the extinction of the gas industry would involve, such, to mention only one, as the future of the large personnel at present employed. So powerful are the coal, iron, and steel interests which are behind the scheme, that undoubtedly a great deal more will be heard of it.

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

Physical and Chemical Survey of the National Coal Resources.

An important aspect of the work on fuel research undertaken by the Department of Scientific and Industrial Research is a survey and classification of the coal seams in the various mining districts by means of physical and chemical tests in the laboratory, supplemented, where desirable, by large-scale tests at H.M. Fuel Research Station, East Greenwich, or elsewhere. The Fuel Research Board of the Department consider that the best way to carry out this work is by means of Local Committees representing the local colliery owners and managers, the local branch of the Institution of Mining Engineers, the Fuel Research Board, and the Geological Survey of Great Britain, as well as outside scientific interests. Each Committee is charged with the duty of supervising the work of the physical and chemical survey in a coal mining area; and in this way the survey becomes of practical value from the commencement, since local knowledge and experience are made available, and the seams to be investigated and the general programme of work are decided by those who are able to estimate most correctly the relative importance of the problems to be solved. The seams selected undergo physical and chemical examination by local investigators appointed for the purpose, after which a final selection is made of those seams likely to justify experiments on a technical scale, in order to test their suitability for particular uses or methods of treatment.

Committees are actively at work in the following areas: Lancashire and Cheshire, South Yorkshire, Nottinghamshire and Derbyshire, and North Staffordshire. Another Committee is dealing with the coalfields of Scotland, and a further Committee has now been appointed to deal with the coalfields of Durham and Northumberland. The Durham and Northumberland Coal Owners' Associations and the North of England Institute of Mining and Mechanical Engineers are co-operating in this work; and the composition of the Committee is as follows: Mr. A. Kirkup, Dr. H. Peile, and Mr. G. Raw, representing the Durham Coal Owners' Association; Mr. S. Bates, Major H. S. Streatfield, and Mr. R. Warham, representing the Northumberland Coal Owners' Association; Col. W. C. Blackett, representing the North of England Institute of Mining and Mechanical Engineers; Prof. H. V. A. Briscoe, Dr. J. T. Dunn, Prof. G. Hicklin, and Prof. G. Poole; Mr. R. G. Carruthers, representing the Geological Survey of Great Britain; Dr. C. H. Lander (ex-officio), Director of Fuel Research; and Mr. F. S. Sinnatt (ex-officio), Superintendent of the Physical and Chemical Survey.

Measurement of Light.—A series of three Cantor Lectures is to be delivered at the Royal Society of Arts, John Street, W.C., by Mr. John W. T. Walsh, M.A., M.Sc., Senior Assistant at the National Physical Laboratory and General Secretary to the International Commission on Illumination, who will take for his subject "The Measurement of Light." The lectures will be given at 8 o'clock on Monday evenings, April 25, May 2, and May 9.

THE CAKING POWER OF COAL.*

Fuel Research Board Investigation.

Two important conclusions are drawn from this work. One is that the binding material in different coals possesses different degrees of thermal stability; and thus the duration of its exposure to heat influences the resultant coke. The other is that the coking value of a coal may be estimated from the "caking power curve" obtained at a slow rate of heating.

A valuable research on the caking power of coal has been carried out by Dr. J. T. Burdekin, a member of the South Yorkshire staff of the Fuel Research Division, under the general direction of Prof. R. V. Wheeler, and under the supervision of Dr. L. Slater, the Fuel Research Division's senior investigator in the South Yorkshire area. An account of the investigation forms Publication No. 8 of the Physical and Chemical Survey of the National Coal Resources.

METHOD ADOPTED.

The investigations followed the lines of Badarau and Tideswell, in that "caking power" curves by these authors were determined for a number of coals. The method consisted in carbonizing, at a definite rate of heating, various mixtures of each coal (from the following seams: Arley, Wigan Four-Feet, Smith, King, and Mountain seams of the Lancashire coalfield; Silkstone, Parkgate, Barnsley, Furnace, and Swallowood seams of South Yorkshire; Black Shale, Tupton, Deep Soft, Deep Hard, and Waterloo of Derbyshire; and Busty and Willington seams of Durham), with calcined anthracite, and determining the resistance to crushing of the resultant cokes. The results were expressed in the form of curves obtained by the crushing strength of the coke against the ratio of coal to calcined anthracite. Three series of experiments were made in which the times taken for carbonization, over the temperature range 100° to 860° C., were seven minutes, three hours, and three hours forty-eight minutes respectively.

First Series.—This afforded little knowledge of the coking properties of the coals. The report states, however, that a maximum point on each curve, occurring at a point corresponding to a large percentage of inert material in the mixture, appears to indicate the existence or formation, under these conditions of carbonization, of a greater or less amount of binding constituent over that necessary to bind the coke-forming basis of the coal.

Second Series.—In this the rate of heating more nearly approached that of large-scale practice. It was expected that the result of this prolonged heating would be to reduce the agglutinating value of the coals. Some of the curves show this to have occurred; the maximum peaks having been entirely suppressed. Others, however, are not markedly different from those obtained at the fast rate of heating; and it would appear that the thermal stability of the binding material of these coals is of a high order. In the simple curves, possessing no peaks, the area enclosed by each curve and the two axes of reference could easily be calculated; and it was found, by examination of the cokes from the same coals in large-scale practice, that a larger or smaller area corresponded to a coal of greater or less coking value.

Third Series.—This was carried out because certain coals failed to give curves of the type desired. Even at this rate of heating (3 hours 48 mins.) one coal—the Mountain seam of Lancashire—did not produce a simple curve. It is suggested that this is an exceptional type.

RESULTS OF INVESTIGATION.

There are three main conclusions: (1) That different coals may contain different amounts of binding material; (2) that the binding material may (in different coals) possess different degrees of thermal stability, so that the extent to which it can play a part in the production of a coke will depend on the duration of its exposure to heat; and (3) that the coking value of a coal may be estimated with a considerable degree of certainty from a consideration of the caking-power curve obtained at a slow rate of heating.

The report states that there appears to be a mistaken view prevalent with regard to the function of the so-called "agglutinating material" in coal, for it is frequently put forward that certain coals contain or produce such an excess of this material that a strong coke cannot be obtained from them. None of the tests carried out with a wide variety of coals gave any indication that this can occur. Invariably the coals richest in binding material, as judged by the extent to which they swell and by the amount of inert material they can bind, give the finest cokes in the oven. It is true that certain coals can be admixed with large amounts of non-caking or poorly caking coals, and still produce a highly satisfactory commercial coke; but the existence of a larger proportion of agglutinating material than is normal for a good coking coal does not reduce the value of a coal for coke manufacture.

* Fuel Research Physical and Chemical Survey of the National Coal Resources, No. 8. "An Investigation of the Caking Power of Coal," by J. T. Burdekin, M.Sc., Ph.D. Published by H.M. Stationery Office, Adastral House, Kingsway, W.C. 2; price 1s. net.

LOW-TEMPERATURE CARBONIZATION.*

Vertical Cast-Iron Retorts at the Fuel Research Station.

Fuel Research Technical Paper No. 17 gives an account of a year's working of the latest type of vertical cast-iron retort for low-temperature carbonization. Owing to the difficulties caused by the coal strike, it has not been possible to carry out tests giving complete and accurate data. The Fuel Research Board have such tests in hand, and in the meantime have published this interim report, in which they say that the retorts are most promising.

RETORTS AND HEATING ARRANGEMENTS.

The retorts†, 21 ft. long, are 6 ft. 6 in. by 7 in. at the top, widening to 6 ft. 10 in. by 11 in. at the bottom. They are made of ordinary grey cast iron, and are divided into three sections. The metal is 1 in. thick. The extraction gear was adopted after discussion with the Woodall-Duckham Vertical Retort and Oven Construction Company, Ltd., and certain of its features are patented by the firm. It has been found satisfactory to operate the extractor gear for a short time only at intervals of one, two, or three hours according to the nature of the coal undergoing carbonization. By suitably arranging the charging periods, rodding has been reduced to a minimum. Except for charges containing a large quantity of coal smaller than ½-in. pieces, no rodding is necessary.

The retorts are heated by water gas which is led in plain steel pipes, bent vertically upwards at the end, into corners of the internal face of the setting. The chimney effect of the corner enables the flame and hot gases to cling closely to the walls, and so contact with the retorts is avoided. The latter are thus heated by radiation from the brickwork of the setting and from the flame. There is also a certain amount of convection heating caused by the circulation of the waste gases. There are three sets of this type of burner, dividing the vertical height of the retorts into three portions. The air supply is led to intermediate positions between the burners at each level; the idea being to retard the rate of combustion of the gas and to lengthen the flame. In the top section the air supply discharges close to the burners, so as to shorten the flames.

WORK CARRIED OUT.

The retorts were in operation from Dec. 27, 1925, till Dec. 27, 1926, during which period they carbonized 1350 tons of coal. Of the coke produced, 200 tons were sold, in lots varying from a few hundredweights to five tons, to about 180 customers. A questionnaire was addressed to each purchaser; and the replies indicate that "the coke forms a satisfactory fuel for burning in the open grate, the kitchen range, the hot water boiler, and under the copper. It is not entirely satisfactory for the present design of top-heated ovens, especially in the larger kitchen ranges. With this fuel available it is evident that there is no need for one supply for the sitting-room fire and another for the hot water boiler or the central heating plant, as is generally the case. . . . It is of particular interest to find that even more satisfaction, particularly as regards cooking, is given by the coke in artisan houses than in larger houses."

Till the end of June, 1926, experiments were carried out on blends of caking and non-caking slacks; the maximum throughput being 3 tons a day. When the supplies of non-caking slack ran out, thanks to the coal strike, an attempt was made to reduce the caking power of strongly-caking slack. This was done by passing the coal through narrow retorts, the combustion chambers of which were kept at 340° C., at such a rate that it was dried and preheated to a temperature of 180° to 200° C. During the preheating, air was allowed to pass up through the charge. The oxidation thus effected was found to be slight, and eventually carbonization of untreated caking coal was attempted.

At this stage of the tests the only coal available was that

* Fuel Research Technical Paper No. 17. "Low-Temperature Carbonization. Vertical Retorts at H.M. Fuel Research Station." Published by H.M. Stationery Office, Adastral House, Kingsway, W.C. 2; price, 6d. net.

† These retorts were referred to in the Annual Report of the Fuel Research Board for 1925 as the "E" retorts.

remaining in stock at the station, except for Durham coal, which was supplied by the South Metropolitan Gas Company. The coal available, however, included non-caking, medium-caking, and strongly-caking varieties; the two former being in lump size, and of the latter some being nut coal and some run-of-mine with the larger lumps broken to pass through 2½ in. All these coals were worked through the retorts satisfactorily. The report states that, though there was insufficient coal to yield actual figures as proof, it was noticeable that ease of working, throughput, and yield of tar increased in proportion to the length of time the coal remained in lump form in the retort. Thus non-caking nuts were the easiest to work, gave the highest yield of tar, and would give the greatest throughput. Slightly-caking nuts would probably approach this closely. Strongly-caking nuts required no rodding, and gave a good throughput and a good yield of tar. With a mixture of lump coal and fines, some rodding was necessary; and the rate of throughput and the yield of tar depended on the proportion of fines. With fine coal, both the throughput and the yield of tar were low, and rodding amounting to about eight minutes per two hours was necessary on each occasion of charging.

RESULTS OF BRIQUETTING.

Fine coal (through a ⅜-in. screen), which amounted to 50 or 60 p.ct. of the Durham coal used, could be dealt with by briquetting. Several tons of ovoid briquettes were made with 4 to 6 p.ct. of pitch as binder; and it was found that these briquettes, when mixed with the lump coal, could be carbonized at an increased throughput. When, however, the briquettes were passed through the retort by themselves, the coke formed was so hard and strong as to be difficult to extract. The small coal was therefore mixed with varying percentages of breeze prior to briquetting. Of these mixtures, 20 p.ct. low-temperature coke breeze, 74 p.ct. coal, and 6 p.ct. pitch was the most satisfactory. These briquettes passed through the retort at a good throughput, and formed excellent coke.

The report contains a table giving the results of such tests as it was possible to carry out in the difficult circumstances caused by the coal strike. As an example, we quote the figures relating to Mitchell Main nut coal and Durham run-of-mine (through ⅜-in., 40 to 60 p.ct.). In each case the retorts were charged at 2-hour intervals. No trouble was experienced with the Mitchell Main nuts, but rodding at the bottom of one of the retorts was necessary for the discharge of the coke in the case of the Durham coal.

—	Durham Run-of-Mine.	Mitchell Main Nuts.
Temperature of setting	625° C.	620° C.
Duration of test	120 hours	96 hours
Throughput per retort per day	2·69 tons	3·52 tons
Gas made—		
C.ft. per ton	5420	4860
Calorific value, B.Th.U. per c.ft.	710	729
Therms per ton	38·48	35·45
Tar, galls. per ton	11·1	13·1
Coke—		
Cwt. per ton	15·04	15·30
Breeze, p.ct. through ½-in. square mesh	18·8	11·9
Volatile matter, *less* moisture—		
On ½ in., p.ct.	6·9	8·4
Through ½ in., p.ct.	8·3	12·3

The amount of fuel gas required may be judged by the fact that 2470 c.ft. of water gas per hour was used for the carbonization of the Durham run-of-mine coal without steam (rate of throughput 2·69 tons per retort per day). This amounts to 59,280 c.ft. per day, or approximately 22,000 c.ft. per ton of coal carbonized—a matter of about 66 therms.

"TELEGAS" TEMPERATURE REGULATOR.

[COMMUNICATED.]

When gas is employed for heating, it is always advisable, from the point of view of economy and efficiency, to use apparatus of sufficient capacity to reach the required temperature in a short time. This brings in its train the possibility of overheating, which means waste of gas, and, in industrial work, spoiling of products.

The need for a good heat regulator applicable to both small and large installations has long been felt; essential features of such a device being extreme sensitiveness and instantaneous response to change in temperature.

To fulfil these conditions, a regulator consisting of a "feeler" and a valve operating mechanism has been constructed. The "feeler" embodies two strips of materials of different coefficients of expansion. Movements of the expansion pair are transmitted to a valve of small dimensions (passing between ¼ and 1 c.ft. of gas an hour). These small variations are led through narrow tubes to another valve, which is built in the pipe feeding the gas apparatus—fire, oven, water heater, &c. The latter valve commands the main gas stream; any slight variations in the small auxiliary gas stream being magnified by it.

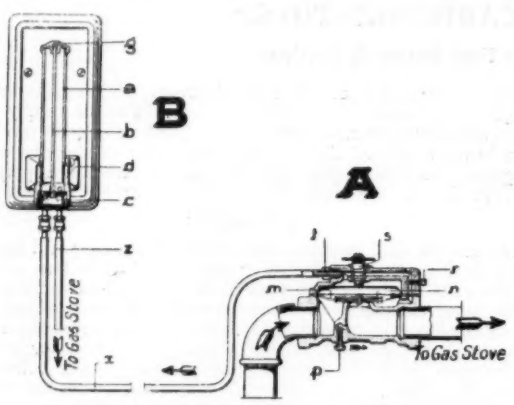


Fig. 1.—Section of "Telegas" Regulator.

It is possible to regulate gas streams from 1 c.ft. to 5000 c.ft. per hour with constant accuracy—an accuracy which gives results with the limit of 1° Fahr.

The sensitiveness of the apparatus is so great that it acts within a few seconds even when a very small change in temperature takes place.

The graphs reproduced show that the apparatus is capable of regulating air temperature within 1° Fahr. when it is applied to a gas stove. In fact, one of the foremost applications of the regulator is in gas-fired central heating installations.

When the "feeler" is placed in one of the rooms of the building, and the valve in the main gas pipe feeding the boiler, and both parts are connected by a narrow tube, constant air temperature can be maintained in the rooms, and all waste of gas avoided.

The patents in England and on the Continent are in the hands of the inventors, Messrs. Nell en Stutterheim, of The Hague.

CONSTRUCTION OF THE "TELEGAS" REGULATOR.

The regulator consists of two parts, A and B, fig. 1. A is the gas valve commanding the gas stream to the heating burner. It contains a light flexible sheet *m*, which prevents gas passing when it is lying down, but gives free passage when lifted. Above this sheet is a gas chamber *n* which communicates over screw *r* and cock *s* in a limited manner with the gas chamber underneath, and with the main gas pipe. From this chamber a tube *x* leads to the feeler. So long as

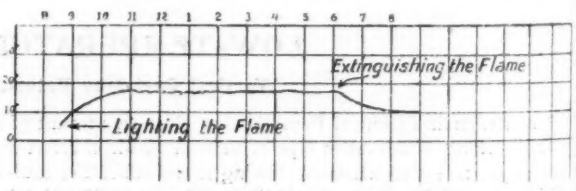


Fig 2.—Graph of the temperature in a gas heated room. Gas stove fitted with "Telegas," in operation from 8.30 a.m. to 6.10 a.m.

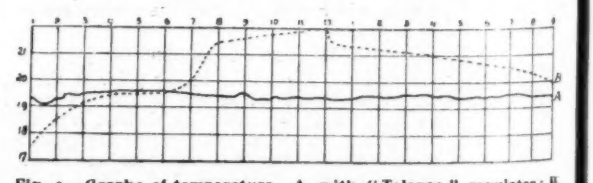


Fig. 3.—Graphs of temperature. A, with "Telegas" regulator; B, with a regulator filled with oil. Variation of A, ½° Fahr.; variation of B, 7° Fahr.

tube *x* gives free escape to the gas; the pressure in chamber *n* will be low, and the sheet *m* will be lifted, by pressure from underneath, allowing a free flow of gas. As soon as tube *x* is stopped up, pressure in *n* will rise, and sheet *m* will fall and obstruct the gas flow. There is a by-pass.

The opening and stopping of tube *x* depends on the influence of temperature on the part B. This part consists of an ebonite tube *a* provided with a brass head *g* which bears a rod of non-expanding nickel steel *c* transmitting the expansion of *a* to a gas valve *c*. This valve opens when the temperature of *a* is too low, and closes when it is too high; thus causing a similar motion of valve *n*. The gas, having served for regulation, escapes by tube *z* to a harmless place in the gas fire.

The exact construction of the "feeler" depends upon the temperatures to be regulated and the apparatus served, and valve A is proportioned according to the gas consumption.

TANKLESS GASHOLDERS.

By Harald Nielsen.

The author "tries to present the picture in such a manner that everybody interested can draw his own conclusions." He foreshadows further developments in the design of the tankless holder.

One of the most interesting departures from standard gas plant practice is undoubtedly the advent of the tankless gasholder. One might almost feel inclined to say that it is one of the greatest liberties taken with (gas-works) nature. To-day much can be said for—and much can be said against—the new type of holder; but, with the latest improved designs, the honours are about even.

With a great friend of mine, the late Mr. Alfred Coates, I went abroad in the autumn of 1923 to try to obtain, as quietly as possible, as much information for and against the new type; and, in view of the fact that these new holders are just about to be introduced in this country, an impartial statement of facts, based on our investigations, may be of general interest.

We went to several places, particularly in Holland; and afterwards the writer, through his continental connections, collected certain data which he believes have up to the present not been published *in toto*. He will try to present the picture in such a manner that everybody interested can draw his own conclusions. Certain lines of improvements, or, rather, safety devices, suggested during the discussion with the various officials who had the gasholders at their works, will also be touched upon.

The Tankless Holder a Machine.

There is one thing which must be made clear at the very beginning, and that is that the new type of gasholder must not be looked upon as a piece of ordinary gas-works plant. It is a machine, and must be treated as such. This mere fact should not cause any hesitation—machines can be made perfectly safe. It stands to reason that all new machines suffer from children's maladies, which only time and experience can surmount. The new type of holder certainly had a black record in the beginning. Here are a few notes collected at various times:

1. At the town of Mugeln a serious explosion occurred during erection when inflation was attempted, and several people were killed outright.
2. At Wurzburg many complaints have been received of gas escaping through the tar lute.
3. One of the Oppau explosions is also stated, from a competent source, to have been caused by one of the hydrogen holders being leaky, and an explosive gas mixture being formed above the float.
4. In Posen another large gasholder exploded, no doubt due to the same source. Unfortunately, the real cause was never ascertained, for very good reasons.
5. The Thuringer Gas Company give a very bad report of their holder.
6. The Chief Engineer of the Zeppelin Works in Staaken is highly dissatisfied, and states that on occasions the float for some reason or other sticks, and, when suddenly freed, causes serious pulsations in the gas delivery.
7. For this particular reason, the long distance supply holder in Geestemunde was recommended not to be of the tankless type.

   The losses in the Staaken holder were very great.
8. The tankless gasholder for a large Zeppelin Works near Berlin was discarded owing to leakages and other trouble, and sold to a Japanese firm, who are erecting it in Japan. A water tank holder was substituted in this case.

   In connection with this holder (the tankless one) it was stated that, owing to the continuous working of the tank sides due to temperature differences and wind pressure, the single vertical rivet seam gave considerable trouble, and serious cracks developed.
9. Director D—— in Konstanz stated, in a lecture he gave regarding the tankless holder, that the guarantee of 2 p.ct. loss of volume per week was found, shortly after taking-over the holder, to be 2·6 p.ct. What this will mean on (say) a 1 million c.ft. holder annually, the following figures indicate: $1{,}000{,}000 \times \frac{2{\cdot}6}{100} \times 52 = 1{,}350{,}000$ c.ft. annually, at 2s. 6d. per 1000 c.ft. = £169, which, taken as representing 5 p.ct. interest on capital = £3380. This sum would go a long way towards meeting any difference in price between a wet and dry holder of this small capacity.

The continuous attendance of a man to look after the gasholder, and the electrical power required for the tar pumps will probably add another £200 to the running cost of the tankless gasholder annually, let alone the possibility of interruptions in working due to failure of pumps and motors, as well as uneven distribution of tar, by which the gas losses will be greatly increased.

The Question of Foundations.

One must bear in mind that one of the most important savings in capital expenditure claimed for the dry holder is in foundations. It is evident that in marshy countries such as Holland and certain parts of France, this plays an important part; but in this country it can hardly be said to have the same importance, as the sub-soil—where there can be a question of erecting such dry holders—is generally good. To erect a dry gasholder in an exposed place in this country would need very careful consideration, even with the present improvements which we saw at Eindhoven, in Holland.

The general design is now well known. It consists of a large container, open to the atmosphere—that is to say, provided with roof structure which permits the outside air to enter the space above the floating piston-like structure, which acts as the crown of an ordinary gasholder. Tightness is supposed to be assured by a tar or tar-oil seal forming part of the piston.

It took a considerable time before a suitable liquid tar was found which would maintain its correct viscosity in all circumstances; but this trouble can be said to have been conquered—that is to say, for some considerable duration. One must always realize that where tar is employed, oxidation and polymerization always take place. It is a mere question of time, atmosphere, and conditions. Coupled with this is a gas of an average specific gravity of only 0·5 (air being 1·0) stored below the piston. There is, therefore, a natural tendency for this lighter gas to pass upwards into the atmospheric space, through any cracks or crevices. Consider further that town gas consists generally of 45 to 50 p.ct. of hydrogen, which is only mechanically mixed with the gas, and is much lighter (specific gravity (say) 0·07, air being 1·0). Thus its tendency to diffusion is far greater. The difficulties of keeping hydrogen confined are too well known to deserve further comment.

It is therefore evident that the air space above the floating piston must be most effectively ventilated. Theoretically, gas should not lurk in pockets and odd corners; but practice has shown that it does. Further, how a gas-air mixture under such conditions can be ignited, is not possible to say; but always the most unforeseen happens, with causes and effects of explosions. Any small local puff will tilt the piston; a very much larger volume of gas escapes, and an infinitely more dangerous mixture is at once formed. It is ignited—and exit tankless gasholder.

New Problems.

The construction of these vast containers introduces entirely new elements and problems in engineering. The designing rests entirely on empirical formulæ. We know nothing whatever about the behaviour of large diameter thin-walled containers subjected to external pressures. Many years ago the writer had the chagrin to witness the collapse of a smaller annular gasholder tank, in spite of this being calculated according to all the best-known rules and regulations, and provided with a safety factor which was considered more than ample. Afterwards it was found that some of the lower vertical plates were not truly circular; the section, therefore, being slightly oval. Hence the unlooked-for collapse.

An Improvement Making for Safety.

Take a tankless gasholder of (say) 800,000 c.ft. capacity—a small holder as gasholders go. The diameter in this will be about 100 ft., and the height (say) 100 ft. Suppose a strong wind of 40 miles an hour is blowing. The pressure exerted by the air is about 8 lbs. per sq. ft., or, in all, $100 \times 100 \times 8 \times k = 80{,}000 \times k$. k is a coefficient depending upon the shape of the resisting container—in this case, perhaps 0·60 to 0·65. In other words, a container made of (say) $\frac{3}{16}$ in. to $\frac{1}{4}$ in. plate, though stiffened by angles and vertical joists of 100 ft. diameter, has to withstand 23 to 24 tons. This presents some pretty engineering problems. When a violent gale is raging, the pressure may go to 50 or 60 tons. A slight elliptical flattening may thus hang up the piston, or at least cause a gas escape. The last few years have been remarkably free from accidents to the tankless holders. Nevertheless, with present systems, the potential changes are there; and this must not be lost sight of. Mr. Coates and the writer, after careful considerations, came to the conclusions that one tar seal is not sufficient, but that if two or more superimposed seals were employed, the dangers of gas leakages could be materially minimized. The writer took the matter up with various well-known continental gasholder designers; and it was agreed that this method presented some advances. For instance, the space between two superimposed seals could be filled with an inert gas, such as carbon dioxide, which could be maintained at will at a slightly higher pressure than that of the inflammable gas under the piston. If any leakages occurred, an observation on a pressure gauge in the inert gas seal would at once indicate trouble, so that steps could be taken in time. Besides, the inert gas would either leak into the atmosphere, causing no harm, or else into the gas proper, and thus increase the revenue of the gas company. Last, but not least, the tar in the bottom seal would not be oxidized, but would maintain its fluidity far better.

These ideas were protected by us in British Patent No. 228,986 [see "JOURNAL," Vol. 169, p. 691.]

Understand that not for one moment must it be thought that this article is to extol the virtues of the above-mentioned patent; nothing of the kind. The patent represents the results of serious considerations from the various angles, with a view to rendering a highly interesting new machine completely safe to work in this country—or, at any rate, as safe as humanly possible. The gas-works in this country have a unique clean record as far as accidents are concerned; and it is up to gas people, whether operatives or designers, to keep this high standard. Human life is always precious; and we must without fear or favour stick to this maxim. Improvements are always wanted, be it in the direction of cheaper gas, or of cheaper and more efficient plant; but we must not lose our sense of proportion.

There are new developments taking place regarding an entirely new type of tankless gasholder which is absolutely safe and foolproof; but the writer is not at the present stage permitted to go into details regarding these. *Festina lente* is perhaps more true here than in many other cases; and there is plenty of scope for gas engineers of an inventive turn of mind. After all, they are the people who are called to work the thing, and to take the blame for their decisions.

MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

ANNUAL MEETING AT THE STANTON IRON-WORKS.

The disturbance of business programmes caused by the long drawn-out coal strike resulted in a modification this year of the arrangements usually made in connection with the annual general meeting of the Midland Association of Gas Engineers and Managers. The President (Mr. Francis C. Briggs, of Dudley), who had in March, 1926, given the Association a Presidential Address of a deeply thoughtful and highly informative character, had been asked to continue in office for a second year; and at his suggestion it was decided that the annual meeting on this occasion should be combined with the inspection of a process of particular interest to the gas industry.

Thus it was that a party of some fifty or more members of the Association assembled last Thursday morning at the spun pipe works of the Stanton Ironworks Company, Ltd., to which the majority of them had been conveyed by motor from Derby. On arrival the visitors, who were headed by the President, were cordially welcomed by Mr. E. J. Fox, M.I.Mech.E. (Managing Director), Mr. P. H. Wilson, M.I.Mech.E. (Foundry General Manager), and Mr. H. A. Taylor (Commercial Manager); and under their guidance, and that of other members of the staff, the various processes connected with the manufacture of Stanton Delavaud spun pipes were closely inspected. In the morning the centrifugal casting of iron pipes was seen, and after lunch the manufacture of concrete pipes on the same principle. They found a large works extremely busy turning out, under well-ordered conditions, pipes whose advantages have been frequently emphasized. Attached to the works are tennis courts and a bowling green; while other evidence also is not far to seek of the interest displayed by the Company in the welfare of their employees. Excellent results in the fostering of good feeling are found to accrue from the establishment of a Works Committee, on which the officials of the various departments meet representatives of the Company's different works and collieries.

CENTRIFUGAL CASTING OF IRON PIPES.

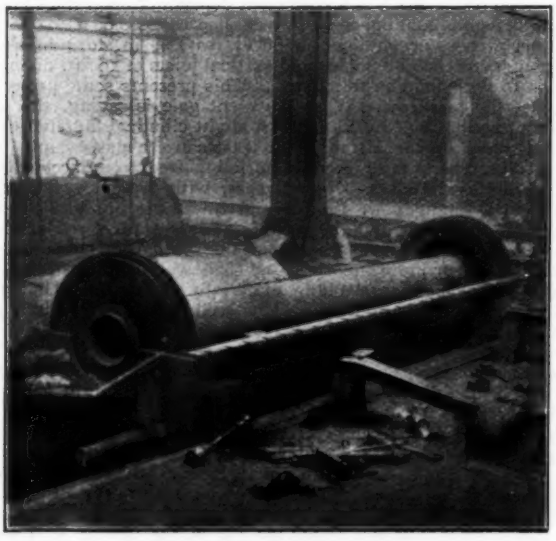
As being the process of special interest to gas engineers, attention may be confined here to giving a brief account of centrifugal casting as applied to the manufacture of spun iron pipes—referring those who are desirous of fuller information to a lecture delivered by Mr. Wilson in Birmingham to the members of the Midland Junior Gas Association.*

* See "GAS JOURNAL" for Dec. 1, 1926, pp. 568-70.

The raw materials—pig iron, scrap, coke, and limestone—are, after being systematically analyzed, discharged from wagons on an elevated railway into ferro-concrete bunkers; the various grades of pig iron being placed in respective bunkers according to the silicon content. Travelling beneath the bunkers are electrically-operated 2-ton carriages upon which are fitted weighing machines. Skips are placed on these carriages, and can be put into position under any particular bunker. The loaded skip, having been withdrawn from the bunker carriage by electric haulage gear, is raised by hydraulically operated hoists to the top of the cupola, into which the contents are automatically discharged through bottom doors. The cupolas have a melting capacity of 10 to 15 tons per hour; and the molten metal is tapped into 3-ton casting ladles, which are conveyed to the casting shop by means of a 5-ton electric crane on a telpher runway.

The pipe is formed in an accurately machined cylindrical steel mould, the inner dimensions of which coincide with the outer dimensions of the finished pipe, including the enlarged formation of the socket end. The mould is revolved on its own axis by means of an impulse water turbine inside a water-cooled iron casing. This revolving mould is supported at two points in its length by two sets of friction rollers which have bearings on the inside of the casing, and are lubricated by grease cups accessible from the outside. The casing, with its revolving mould, is caused to traverse backwards and forwards on its bedplate by means of a hydraulic cylinder beneath the casing. Through the annular space between the cylinder and the casing the cooling water is circulated; being kept at a constant temperature and pressure. A tilting ladle and a cantilever trough supply the metal to the revolving mould.

The only core used is that which is necessary to shape the inside of the socket. The bedplate of the machine slopes slightly away from the tilting ladle, so as to give the metal, during casting, the requisite fall, and ensure uniform thickness of metal in the pipe. The casing containing the mould is moved up towards the tilting ladle; the cantilever trough projecting into the interior of the mould towards the socket end. The pelton wheel is started; and when the mould has acquired the proper speed, the tilting ladle discharges the molten iron down the cantilever trough. When the socket portion of the mould is filled with metal, the casing is traversed away from the tilting ladle at a definite speed, which assures the molten metal lining the mould evenly throughout its entire length. When the mould reaches its extreme position, it is clear of the



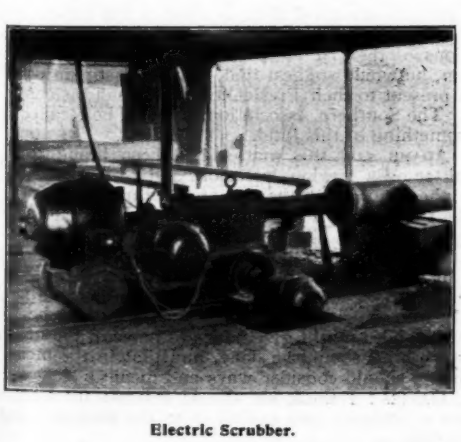
Cylindrical Steel Mould

Casting Machine.

Withdrawal of Pipe.

end of the spout, and any excess of metal in the trough is discharged into a receptacle at the side of the machine. The rate of tilting the ladle, the peripheral speed of the mould, and the traverse of the machine, are in a definite ratio for any particular size and thickness of pipe. The molten metal solidifies in a few seconds; and when contraction has taken place, the pipe is withdrawn. Owing to the rapid cooling of the pipe in the water-cooled mould the outer skin is slight chilled; and it is necessary to heat-treat the pipe in order to normalize this structure. For this purpose, it is passed straight from the casting machine to a gas heated annealing furnace. The next process is mechanical cleaning and internal scrubbing, after which come the dipping tanks, where the pipe is coated. Reaching the hydraulic testing pumps, each pipe is tested to double its working pressure. On account of the increased strength of the spun metal, it is possible to effect a saving of 25 p.ct. in the weight of the pipe.

The speed of rotation of the mould is an important factor in the satisfactory production of centrifugal castings; and the optimum speed is known for each size of pipe cast. The process itself consists of the deposition of a continuous spiral of metal inside the rotating cylindrical mould; and it is clear, therefore, that to produce castings of uniform section the metal must flow



Electric Scrubber.

at a constant rate. This is achieved by the special design of the tilting ladle. Other important factors involved in the introduction of metal into the mould are the rate of delivery from the pouring spout, and the angle at which this delivery takes place. The ideal direction of flow of the metal leaving the spout would be when the tangent to the mould at the point where the metal touches it for the first time coincided with the tangent to the parabolic curve described by the metal. This, in practice, is impossible; but the spout-end has been so designed, and is placed in the mould in such a position, as to make the angle between the two tangents very small. The synchronizing of the rate of tilting the metal, the speed of the traverse of the machine, and the peripheral speed of the mould, are highly important factors.

LUNCHEON.

As the guests of the Directors of the Company, the members sat down to luncheon in the staff dining room, when

Mr. Fox said he hoped they had been interested in the new method of making iron pipes centrifugally. These pipes were being very largely adopted for gas and water purposes; and the plant they had seen was turning out between 50 and 60 miles per week of centrifugal pipes, in sizes from 4 to 15 in. No doubt there were still some gas engineers who were inclined to say to themselves: "We will let someone else have a go at these pipes; and after they have been in use for twenty or thirty years, if they are all right, we will try them." This, of course, would be a very safe and sound way of arguing; but during that twenty or thirty years when somebody else was being allowed to make the test, those who waited would be losing the interest on the difference in cost between the old cast-iron pipes and the cheaper and more modern method of making pipes centrifugally. However, the Company were grateful to those of their clients who had adopted spun pipes, and they were also grateful to those who had not done so, but were still using the old-fashioned pipe, because they were just as anxious to keep one set of plant going as they were the other.

The PRESIDENT thanked Mr. Fox for his welcome, and then asked those present to drink to the health of the Chairman and Directors and the prosperity of the Stanton Ironworks, Ltd. He said that during the tour of the works all had been struck by the rate at which the pipes were turned out. The firm were to be congratulated upon the general lay-out of the plant. Every care was taken to see that both material and workmanship were of the very best. This was exactly what one would expect of the Stanton Ironworks, who enjoyed the highest reputation, not only for the character of the work turned out, but for integrity of business methods and good treatment of employees. Mr. Fox was particularly keen on looking after the welfare of the employees; and this was the right point of view to adopt—it was the policy which was going to save British industry, if it was properly carried out. He thanked the firm for their hospitality, feeling certain that the visit would be as valuable as it was proving enoyable.

BUSINESS MEETING.

The Annual General Business Meeting of the Association followed immediately after lunch—Mr. FRANCIS C. BRIGGS (the President) in the chair.

LATE MR. B. W. SMITH.

The PRESIDENT said that his first duty was the painful one of referring to the death recently of one of their very old members, Mr. B. W. Smith, of Walsall, who was elected a member of the Association in 1881, acted as President in 1893, when he was at Smethwick, and was afterwards made an honorary member of the Association. On behalf of the Association a wreath was sent; and he (the President) and other members were present at the funeral. In respect to the memory of their departed friend, he would ask the members to rise silently in their places.

MINUTES AND APOLOGIES.

The HON. SECRETARY (Mr. T. Thornton, of Rowley Regis) then read the minutes of the last meeting, and they were confirmed. He also intimated the receipt of a number of apologies for absence, including the Presidents and Secretaries of kindred Associations.

The PRESIDENT said he was sorry that Mr. J. Ferguson Bell, of Derby, and Mr. John Wilkinson, of Nottingham (the President of the Institution of Gas Engineers), had found themselves unable to carry out their intention to be present.

NEW MEMBER.

Mr. Gilbert Reid Macfarlane, Engineer and Manager of the Tipton Gas-Works, was unanimously elected a member of the Association.

REPORT AND ACCOUNTS.

The PRESIDENT remarked that they had now to consider the annual report and accounts, including the emergency fund account; and he formally moved their adoption. The accounts showed a balance at the end of 1926 of £129 5s. 2d., whereas they had started the year with £135 19s. 1d. in hand. It would be remembered that they contributed £10 10s. to the Benevolent Fund of the Institution of Gas Engineers; and apart from this they were in much the same position as twelve months ago.

Mr. A. ROBERTS (Hereford) seconded the motion, which was agreed to.

A JUBILEE.

The PRESIDENT pointed out that the Association was approaching its jubilee. Looking back, he found that the first minutes were dated Sept. 20, 1877, when a meeting including Messrs. Charles Hunt (Birmingham), John Annan (Wolverhampton), Thomas Collett (Dudley), William North (Stourbridge), J. Tindall (Walsall) resolved to form an Association. The first meeting of the Association took place in the Midland Hotel, Birmingham, on Oct. 11 of that year, when the officers were appointed; and on Jan. 10, 1878, at the first ordinary general meeting, Mr. Charles Hunt, who had been elected President, delivered his Inaugural Address. They were happy to know that Mr. Hunt was still with them, and was one of their honorary members. The fact that the Association would reach its fiftieth birthday in January next was a matter which

the Committee would consider later on. Personally, he did not think the event should be allowed to pass without recognition; they should mark the significance of the date in some suitable manner.

BENEVOLENT FUND.

Proposed by Mr. W. WILSON (Burton-on-Trent), and seconded by Mr. W. H. ADAMS (Bilston), it was resolved to contribute this year £10 10s. to the Benevolent Fund of the Institution of Gas Engineers.

COMMERCIAL ASSOCIATION.

The PRESIDENT stated that Mr. W. E. Caton, of Oxford, the new Chairman of the Midland Commercial Gas Association, was unable to be with them; and he would ask Mr. Langford, as Vice-Chairman, to submit the report.

Mr. P. N. LANGFORD (Coventry) said this was the thirteenth annual report of the Commercial Gas Association. During the past year the membership had been increased by 9; and there had been one resignation. This made a total membership now of 66. Times had been difficult; but they had held three meetings, which were no doubt of great benefit to the members. With regard to the accounts, there was at Dec. 31 last a balance of £115, which compared with £134 a year ago. But it had to be remembered that the subscriptions had been halved, so that the balance in hand would be gradually depleted. He moved the adoption of the report and accounts.

Mr. H. DAVIES (Chesterfield) seconded this, and it was agreed to.

The PRESIDENT said he desired to impress upon those who were not members the value of belonging to the Commercial Association. During the eleven years he had been in the Midlands he had found the meetings of great advantage to him. By this means, one was kept in touch with the general trend of markets. It was a strong point with the gas industry that they pooled the whole of their resources. This sort of thing did not exist to the same extent in other industries.

REPRESENTATIVE ON INSTITUTION COUNCIL.

On the proposition of the HON. SECRETARY, seconded by Mr. W. G. S. CRANMER (Willenhall), Mr. Briggs was appointed as the representative of the Association on the Council of the Institution of Gas Engineers.

REPORT ON EDUCATION SCHEME.

The PRESIDENT remarked that at the previous meeting the Committee had been instructed to consider the Institution Education Scheme. On Feb. 3 they had a Committee meeting, and discussed the matter; and previous to this the Midland Junior Association had had a meeting to talk over the subject themselves, because they had been invited to join in the conference on the question fixed for March 9. He attended the junior meeting, and gave his views from the senior point of view; and they in part acted on his suggestions. On Feb. 17 there was another Committee meeting, at which the junior report was again considered. This report was to the effect that the present scheme did not meet the needs of the case, largely because the gas industry was so widely scattered. The scheme was based on so many hours' instruction; and it was only students near the big towns who could get the necessary instruction. The juniors therefore were quite against this. They felt, also, that membership of the Institution of Gas Engineers should depend on the examinations. The views of the Midland Juniors were concurred in by other Junior Associations; and a general report on these lines was drawn-up. The Scottish Association, however, presented their own report. He was asked to set out the opinion of the Senior Association on the subject; and accordingly he addressed the following letter to Mr. Walter Dunn, Secretary of the Institution of Gas Engineers.

Gas-Works, Dudley,
Feb. 22, 1927.

DEAR SIR,—In view of the Joint Conference of the Junior Gas Associations called by the Council of the Institution to consider the Education Scheme, the Committee of the Midland Association of Gas Engineers and Managers feel that the opinion of the districts may be of some value to the Council in helping them to achieve the success that is so eminently desirable. They have therefore given the matter careful consideration upon two occasions, and request me with all deference to place the result of their deliberations before the Council.

In view of the scattered nature of gas undertakings, and of the very small number of possible students that can be expected from each, my Committee consider that Division III. of the scheme should take the form of examinations only; no conditions being imposed as to the place or manner in which instruction is obtained, subject to evidence being produced of satisfactory practical training and experience. The present scheme prevents eminently desirable and highly educated and trained men from obtaining the Institution's certificates.

They consider, further, that the Education Scheme and admission to the Institution should be more closely allied. They feel that such admission should in future be by examination only normally, and that the scheme should be remodelled to that end.

They consider that these alterations would result in an increase in the number of men obtaining desirable instruction and applying for examination, in an increase of the number of young men in the industry entering the Institution in an appropriate class, and in a desirable improvement in the Institution's professional status.

Yours faithfully,
(Signed) FRANCIS C. BRIGGS, President,
Midland Association of Gas Engineers and Managers.

Mr. R. J. ROGERS (Birmingham) felt that the members of the Association were greatly indebted to the Committee for showing so much interest in a subject which affected the whole of the younger members of the industry. He had heard reports of the result of the conference which took place in London earlier this month, and could say that the members of the Junior Associations were very disappointed. It seemed to him that it would be up to the Senior Associations throughout the country to support many of the views that had been expressed on behalf of the Junior Associations. Whether or not the matter had been presented to the Advisory Board in the right way, he did not know; but he did feel that in the memorandum which had been submitted there were many items that should be considered by the Board if the scheme was to be a success in the future. For this reason, he urged that the Committee of the Association should keep very closely in touch with the juniors in this matter, and support them in every way possible. There were many points which obviously must be reviewed; and that as to the number of hours' compulsory attendance at classes was one which he was convinced must be remodelled. The Junior Associations had had their attention drawn to cases, in various parts of the country, where it was shown to be quite impossible for young men in the industry to fulfil this condition. Provided the student could obtain the necessary knowledge to enable him to pass the examination, it seemed to him (the speaker) that it did not matter whether he did so through a correspondence course or in any other way. He moved that the action of the Committee be approved.

Mr. DAVIES seconded, and congratulated the Midlands upon the efforts they were making to render the Education Scheme a success.

The members unanimously signified their approval.

PROPOSED PRESIDENTIAL SOUVENIR.

Mr. DAVIES remarked that, in view of the satisfactory financial position of the Association, and having very pleasant recollections of the last meeting of the Manchester District Institution, he would suggest that, like the last-named body, they should present to their Presidents some small memento of their office. The Southern Association, it would be recalled, had also done something of this kind.

Mr. ADAMS said this matter had been brought before the Committee on a previous occasion, and he proposed to bring it before them again at their next meeting. In his view, the President and Past Presidents should have some souvenir of their year of office.

Mr. WILSON asked whether notice should not have been given of the intention to raise this matter.

The PRESIDENT said the matter had been before the Committee. It was, however, not an urgent one; and he suggested that Mr. Davies might give notice to move at the next meeting that something should be done, and that in the meantime the Committee should consider ways and means.

Mr. DAVIES: I think we should instruct the Committee to prepare a proposal and submit it to the next meeting of the Association.

Mr. ADAMS seconded this, and it was agreed to.

On the proposition of Mr. WILSON, a hearty vote of thanks was passed to Mr. Briggs for presiding over the meeting, and for having arranged this enjoyable visit to the Stanton Iron Works.

North British Association of Gas Managers.—The spring meeting of the Association will be held on Friday, April 8, in the Burgh Hall, Church Street, Dumbarton. By invitation of the Provost, Magistrates, and Councillors of the Royal Burgh of Dumbarton, members will be entertained at luncheon in the above hall at 1 o'clock. The business meeting will follow immediately after lunch. The chair will be taken at 2.30 p.m. The President, Mr. James Bell, of Dumbarton, will deliver his Presidential Address, which he proposes to throw open for discussion. Members are invited to visit the new gas-works at Dumbarton during the forenoon.

Accident Prevention.—The question of industrial accident prevention is a matter much in the public mind. Undoubtedly, by the efficient use of educative publicity such as that issued by the National Employers' Mutual General Insurance Association, Ltd., accidents can be prevented. The Accident Prevention Department of the Association are at the service of any industrial organization, independently of the question of insurance. Posters illustrating common preventive methods are issued weekly for display to employees. Other literature is published monthly, including a journal entitled "Industrial Safety."

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

[The thesis "Carbonization—Present and Future," which Mr. S. H. Miles presented to this meeting, and which gained for the author the Diploma of the Institution of Gas Engineers, is a strong vindication of the vertical retorting system. Mr. Miles' statement that one of the advantages of verticals was that they carbonized successfully any type of coal, naturally came in for comment in the discussion on the paper. The author, however, was undaunted by the criticisms.]

In the programme of the Association, the meeting held at the Westminster Technical Institute on Friday, March 25, was termed a "short paper" evening. As a matter of fact, however, the papers read were the theses which gained for Mr. S. H. Miles, of Reading, and Mr. J. H. Goldsmith, of the South Suburban Company, the Diploma of the Institution of Gas Engineers; and the time at disposal allowed of only one of the contributions being discussed—that of Mr. Miles. The discussion on Mr. Goldsmith's thesis was postponed till the annual meeting on May 6; and in view of this it is considered preferable to hold over the publication of this thesis, which was entitled "Some Points in the Design and Operation of Horizontal Retort Settings."

Mr. ARTHUR BROADBENT, of the Gas Light and Coke Company, presided, and, in asking Mr. Miles to read his paper, said how desirable it was that the members of the Association who gained the Diploma should present their theses to the Association

CARBONIZATION—PRESENT AND FUTURE.

By S. H. MILES, of the Reading Gas Company.

During the past decade a number of circumstances have combined to concentrate considerable attention on the numerous problems connected with fuels and their utilization, so that the consideration of modern methods of coal carbonization is now of considerable importance and interest. When we reflect how, in the two main branches of the carbonizing industry —viz., modern gas-works and coke oven plants—scientific methods are being substituted for the "rule of thumb" and guesswork of the past, we realize how the gradual evolution of efficiency has been speeded-up in the last ten to twenty years.

Beneath the variety of explanations, suggestions, and theories put forward, and methods and processes adopted and proposed, there runs the desire to get nearer to the ideals of carbonization by eliminating waste, unnecessary losses, and undesirable features by constantly endeavouring to improve the results obtained. Up till fairly recently, the gas industry has considered as the main aim of carbonization the production of the largest possible volume of gaseous products, with the result that the quantity, and more especially the quality, of the coke and other important bye-products formed were regarded as matters of secondary importance, as even the still common designation "residuals" shows.

More especially since the adoption of the modern therm system, it has been increasingly realized that the destructive distillation of coal is a chemical process, the aim of which should be to obtain the maximum yield of useful products from the thermal energy available in the coal, with as little waste in fuel consumption, &c., in the process as methods rendered available by scientific knowledge can devise.

Before proceeding to discuss the carbonizing methods of to-day and of the future, it is desirable to review the main factors which have given rise to present-day developments and improvements, and consider if they are still likely to have a bearing on future problems.

They can, it is maintained, be grouped under the following headings:

1. The general adoption of lower-grade gas and the modern therm system rendered practicable by the Gas Regulation Act, 1920.
2. Cost of labour.
3. Cost of coal.
4. The demand for better quality coke.
5. Competition.

INFLUENCE OF THE THERM SYSTEM.

Progress has been made rapidly since the dropping of the obsolete illuminating power standard and the establishment of the industry on the therm system and the calorific value basis of production and charge.

To-day the old fetish of concentrating on stretching the make of gas per ton seems to have yielded only to the idea of a competition in yields of therms of the gaseous products per ton. This is some advance; but to approach a scientific basis it is essential to consider the total yield of therms of all the products of carbonization, and endeavour to bring this figure, as near as scientific methods will allow, to the total number of therms in the coal from which they are derived, by reducing the difference represented by the process loss.

In addition, as the relative values obtained for therms of gas, coke, and tar respectively vary from time to time, and as the distribution of total therms produced into the solid, liquid, and gaseous forms is determined in part by the constitution of the coal treated, but in greater measure by the method of carbonization employed, therefore it will be increasingly important in future to consider the flexibility of carbonizing plant from these various aspects.

LABOUR.

The fact that the present-day rates of payment for labour are at least double those of pre-war days is a most important item when considering the choice of carbonizing plant. Among the many improvements in modern horizontal retort practice which can be attributed in part to the desire to save costly stoking labour are:

(*a*) The adoption of improved stoking machinery to facilitate the charging and discharging of a greater number of retorts in a given time. One of the latest examples of this is the new Hollander-Gibbons charger-discharger. This machine, seen at work recently on trial, empties and refills a retort so rapidly that, when working with an ordinary type of hot-coke conveyor, the freshly discharged coke is not sufficiently out of the way to enable the men to get forward and close the retort lids sufficiently promptly to keep pace with the machine. A more rapidly moving type of conveyor will, therefore, be called for to effect the desired economy in labour.

(*b*) The policy of filling the retort has curtailed carbonizing costs by at least halving the number of times the coal is handled.

(*c*) The use of Congdon pipes, and the substitution of one larger ascension pipe at one end taking gas from two retorts, in place of two pipes to each retort, save labour in augering and pipe cleaning.

(*d*) The use of coke conveyors to save the employment of "bus" men.

(*e*) Improved types of grate, such as the grille, step, and screen bar patterns, and in some instances the use of mechanical pokers, help to reduce labour in clinkering and cleaning fires.

(*f*) Improvement in the type of coke skips used for filling fires, and in some cases the adoption of independent outside producers, have speeded-up work in the retort house.

Despite these and other labour-saving devices, the horizontal system is still the most costly from the standpoint of labour costs per 1000 c.ft. of gas produced; and from the business point of view, apart from the question of scientific carbonization, this has undoubtedly largely contributed to the supersession of horizontals by the modern continuous vertical retort system.

COST OF COAL.

The cost of coal, the raw material of carbonization, has also advanced something like 100 p.ct. above the pre-war figure, and there appears to be little likelihood of any appreciable reduction in the future. Hence the desirability of converting as large a percentage as possible of the available therms in the coal into saleable therms, and thus effecting saving on raw material. In addition, the gradual dwindling of supplies of good gas coal will become a much more acute problem in the future, and it will be necessary to explore the possibilities of carbonizing other classes of fuel.

COKE.

In the writer's opinion, one of the leading factors which must now be considered (though it has been sadly neglected in the past) is the need for producing better coke, suitable for the numerous purposes for which solid smokeless fuel is required.

COMPETITION.

During the last decade, the advances of the sister industry, electricity—more especially in the fields of lighting and power—have sharpened the need of marketing the gaseous therm as cheaply as possible to enable the gas industry to maintain its supremacy. Further rivalry is threatened by the setting-up of a low-temperature carbonization industry having for its main object the production of solid smokeless fuel.

DEVELOPMENT.

At the beginning of the present century practically the whole of the coal gas made in this country was produced from horizontal or inclined retorts. Now it is calculated that over 50 p.ct. of the coal gas made in this country is produced in continuously-operated vertical retorts. In the early years of the century, various forms of vertical retorts, chiefly of the intermittent type, were experimented with; but it was not until the introduction of what have so far proved to be the most popular types of continuous verticals—viz., the Woodall-Duckham and the Glover-West—that the supremacy of horizontals was seriously challenged. As their efficiency was demonstrated, and became more widely known, a number of installations of both types were erected; and when the changed conditions of the war period

arose, it seemed at one time that verticals would carry all before them, and that the end of horizontal retorting had approached. To-day it would be untrue to say that there is a general consensus of opinion among gas engineers in favour of the adoption of verticals, for recently large installations of up-to-date machine-stoked horizontals have been installed at Stretford, Burnley, Oxford, Huddersfield, Walsall, and other large undertakings.

In a few instances there has been a reversion to the older method after experience of the new. Despite this, however, it is the writer's contention that in view of their achievements to date, coupled with their possibilities in respect of future requirements, modern continuous verticals offer the best medium for efficient and scientific carbonization. To justify this assertion, it is proposed to consider in some detail, not only in a general review, but in the light of personal experience, both the merits claimed for and the defects alleged against the continuous vertical retort system.

YIELDS.

The yields of both gas and B.Th.U. per ton of coal are increased, as also is the quantity of tar and ammoniacal liquor produced. There are many factors which affect the yield, of course, but the writer's experience is borne out by the results shown by others. With average combustion chamber temperature of 1300° C., and moderate steaming, a make of 17,000 c.ft. of gas of a calorific value of 480 B.Th.U. is obtained from ordinary good-class gas coal. This is equivalent to over 81 therms per ton. It is to be doubted whether even the most modern horizontal plant could attain this figure.

Unfortunately, at the works with which the writer has the privilege of being connected, the gas streams from the vertical and horizontal retort houses are mixed at the inlet to exhausters; and, therefore, during the greater portion of the year it is not easy to know with accuracy of what the verticals are capable. Usually, however, during the summer months they are working alone, and are then regarded as under a prolonged test.

The following tables show how thoroughly verticals have justified their adoption:

TABLE I.—*Working Results.*

Plant and Conditions.

Type of retort	Glover-West
Total number of retorts	40
Duration of test	22 weeks
Average number of retorts at work	38
Pull at inlet of retort house governor	1½ tenths
Pressure on top of retorts	*Nil*
Temperature at outlet of retort house governor	170° Fahr.
Combustion chamber temperature	1300° C.
Steam pressure to retorts, average	14 lbs. per sq. in.
Steam, p.ct. on coal carbonized	12

Coal.

Tons carbonized, actual	14,564 tons 17 cwt.
Nominal throughput, tons per retort per day	2·50
Actual throughput, average tons per retort per day	2·46

Gas.

Actual make	250,639,000 c.ft.
Make, corrected to 60° Fahr. and 30 in.	246,612,000 ,,
,, per ton, actual	17,208 ,,
,, ,, corrected	16,932 ,,
Average make per week	11,392,000 ,,
,, ,, day	1,627,000 ,,
Calorific value, B.Th.U.	479
Therms per ton of coal corrected	81·10

Impurities.

H_2S. Inlet of purifiers; grains per 100 c.ft.	658
Sulphur compounds in purified gas; grains per 100 c.ft.	38·07
Naphthalene in purified gas; grains per 100 c.ft.	1·5

TABLE II.—*Bye-Products.*

Coke and Breeze.

Coke made for sale, cwt. per ton of coal carbonized	8·99
Breeze made for sale, cwt. per ton of coal carbonized	1·15
Total coke and breeze made for sale, cwt. per ton of coal carbonized	10·14
Percentage of breeze in total	11·4

Fuel.

Lbs. of fuel used in producers, per 100 lbs. of coal carbonized	15·0

Tar.

Gallons made per ton of coal carbonized	13·5

Liquor.

Gallons made per ton of coal carbonized (corrected to 10·32)	33

During this period a mixture of various coals was in use, usually five or six kinds, mainly Yorkshire, and all of good quality, as the following typical analyses (each the average of a number of samples) show.

TABLE III.—*Analyses of Coals Carbonized, P.Ct.*

—	1.	2.	3.	4.	5.
Ash	6·55	8·50	3·90	6·00	6·10
Moisture	1·60	1·26	1·48	2·49	0·90
Volatiles (organic matter)	31·07	29·72	32·10	34·01	30·97
Free sulphur	0·59	0·88	0·76	0·49	0·66
Fixed sulphur	0·82	1·34	1·26	0·88	1·25
Total sulphur	1·41	2·32	2·02	1·37	1·91
Fixed carbon	60·78	60·30	62·51	57·50	61·86

LABOUR COSTS.

The labour costs are considerably reduced. In this respect, a study of the "Gas World" Analyses of Accounts for recent years is instructive.

47 companies, 1924—
Average total labour cost . . . . . 0·76d. per therm

The 8 companies using continuous vertical retorts—
Average total labour cost . . . . . 0·69d. per therm

69 municipal undertakings, 1922-23—
Average total labour cost . . . . . 3·76d. per 1000 c.ft.

The 12 undertakings using continuous vertical retorts—
Average total labour cost . . . . . 2·72d. per 1000 c.ft.

"Gas World" Analysis of Municipal Gas Accounts, 1924-25—
Average labour cost for the 67 municipal gas undertakings is . . . . . 3·16d. per 1000 c.ft.

Average labour cost for the 10 best examples where horizontal or inclined retorts only are used—
Average labour cost . . . . . 3·54d. per 1000 c.ft.

Average of the 10 lowest undertakings . 1·68d. per 1000 c.ft.

Of these, 8 undertakings make the whole of the gas in verticals.

There is a considerable saving in the amount of coal required; this being rendered possible by the greatly increased yields of all products.

CONSTANT QUALITY GAS.

The gas made in continuous verticals is of practically constant calorific value and specific gravity. This is one of the advantages of verticals which even their critics do not dispute, and the value and importance of which is greatly enhanced in the light of modern knowledge and conditions. To those accustomed only to horizontal retort practice, the silent witness of a recording calorimeter, working on the gas stream produced from continuous verticals, is a veritable revelation.

With the older method, the variation in quality is anything from 30 to 60 B.Th.U. over the period between charging retorts. In contrast to this, the calorific value chart of vertical coal gas is almost a straight line, and during the 24 hours the difference between the highest and lowest values recorded will not be more than 10 B.Th.U.

The specific gravity is a little higher than that of straight coal gas produced in horizontal retorts; under moderate steaming conditions it is generally about 0·46, and keeps practically constant about this figure. If the conditions of temperature, pull on retorts, and steam pressure are kept as regular as possible, the composition of gas will show a remarkable consistency. This is seen from the appended table of typical analyses made at various times during the period referred to in Table I.

TABLE IV.—*Analyses of Gas Produced from Continuous Verticals.*

CO_2	3·7	3·4	4·6	4·7	4·8	5·0	4·7	3·7
C_nH_m	2·3	2·2	2·6	2·1	2·1	2·3	2·2	2·3
O_2 †	0·3	0·5	0·5	0·4	0·3	0·5	0·5	0·5
CO *	11·7	12·7	11·5	12·40	12·7	11·5	12 0	13·4
CH_4	23·23	24·02	25 65	23·34	23·87	25·00	28·90	21·72
H_2	51·47	50·85	50·00	50·46	50·06	50·43	44·42	51·30
N_2	7·30	6·33	5·05	6·60	6·17	5·07	7·28	7·08
Total inerts (including O_2)	11·30	10·23	10·15	11·7	11·27	10·57	12·48	11·28
Calorific value, calculated	491	485	484	486	490	482	484	480
Calorific value, actual	489	482	480	485	483	476	479	470
Steam pressure to retorts, lbs. per sq. in.	10	12	15	18	18	18	15	12
Steam, p.ct. on coal carbonized	10	11·5	12·5	13·0	13·0	14·0	12½	11½
Coal throughput, tons per retort per day	2·57	2·36	2·38	2·52	2·52	2·40	2·38	2·36
Number of retorts at work	38	38	38	38	38	38	38	38
Average hourly make, thousands	61	70	68	69	69	68	68	70

* At the time when these tests were made, the steam admitted to the retorts was not superheated, and the temperature of the bottom combustion chambers was rather low.

† Air for oxide revivification *in situ* is admitted at the inlet of exhausters.

IMPURITIES REDUCED.

The impurities in the gas are appreciably reduced—largely, no doubt, owing to the fact that in verticals there is practically no "free space" in which the newly-formed gas can be subjected to degrading influences. This is another important fac-

tor in favour of continuous verticals which critics have found impossible to refute.

(*a*) *Naphthalene.*—The writer's experience bears out the claim that vertical gas is practically free from naphthalene. From a large number of tests made over a long period prior to the adoption of verticals, it was found that the naphthalene present in the purified coal gas made in machine-stoked horizontals (carbonizing 10 cwt. per retort in 8 hours) varied between 3 and 12 grains per 100 c.ft., but seldom dropped to the lower figure. When the verticals were working alone, tests showed that the naphthalene present was reduced to 1½ grains per 100 c.ft.

(*b*) *Sulphur Compounds.*—Here again the figure quoted in Table 1, confirm the experience detailed by others. Using practically the same coals, but carbonizing in horizontals, the tests for sulphur compounds in purified coal gas usually averaged 45 grains per 100 c.ft., but for some half-years the figure was considerably higher. With verticals this was reduced to 38·07 grains. Taken over another period of 10 weeks, when the verticals were working alone, the figure was slightly higher—viz., 39·45 grains per 100 c.ft.—but at this time the verticals were in rather bad condition, and were let down for resetting a few months afterwards.

(*c*) *Sulphuretted Hydrogen.*—It was found that the introduction of verticals was followed by a considerable decrease in the amount of H_2S present. Daily tests have been made for years past at the inlet to purifiers, and previously the figure averaged about 850 grains per 100 c.ft. During the two periods when the verticals were working alone, the figures for H_2S were 658 and 692 grains respectively. In many instances, lower figures have been obtained, and probably would have been in this case had it not been for the rapid expansion of output since the war, which has so far made it impossible to rearrange the washing plant in order to obtain the greatest possible extraction of H_2S by wet purification.

(*d*) *Cyanogen.*—The amount of cyanogen present is reduced by 50 to 100 p.ct.

Output.

The output of gas per unit of ground area is increased usually at least twice, and, with the latest models of continuous verticals, considerably more than twice, that from horizontal retorts. This is important when considering extensions to carbonizing plant. Many existing gas-works were built on sites which were formerly on the edge of the town or city they supplied, but, in course of time became hemmed-in by other buildings. Horizontal installations occupy considerable ground space; and if there was no alternative, an extension at the present time might involve heavy expenditure in acquiring neighbouring property, or, perhaps, the even more costly expedient of erecting an entirely new works on a fresh site. The solution is usually simplified by the adoption of verticals.

Better Conditions.

There is not nearly so much laborious work in a vertical retort house, and the conditions are much better, largely owing to the absence of the clouds of smoke and steam which are usually such a feature of the horizontal house. The stokers do not have to withstand intense heat on their heads and bodies as when charging retorts or filling fires in a horizontal house. The vertical producers are filled with cold coke from a skip supplied by an overhead storage bunker, while the coal hoppers over the individual retorts are each filled in a few seconds by moving the lever operating the coal valve. The bugbear of stopped gas offtake pipes is abolished, and with it much heavy labour in auguring, though it is good policy to try all pipes once a shift with a short auger. Scurfing is not a difficult matter, as the retort is allowed to empty itself of coal, and the carbon is then turned off by admitting air at the base. Bars should never be used, as it is essential that the retort walls be kept as smooth as possible. In the writer's opinion, it is not necessary to scurf more often than once in six weeks; and many retorts will go longer without accumulating an excessive charge. The growth of the carbon layer is kept down by the friction of the constantly descending coal charge. Furnace attendants are not called upon to perform any arduous clinkering, which is obviated by the adoption in all modern verticals of large producers fitted with up-to-date grates, usually of the step pattern.

It is the writer's experience that any tendency to overpulling must be avoided. It is of the utmost importance that a slight pressure should be maintained on the top of the retorts. Overpulling, especially if combined with high heats on the upper parts of the retorts, causes the crude gas to be itself carbonized in the offtake pipes, resulting in pitched-up collecting mains. In the past, trouble was also experienced with blockages caused by deposits of ammonium chloride. If the mains are supplied with a small feed of liquor, and are run off regularly, no trouble will be experienced on this account.

Flexibility.

The continuous vertical system gives a flexibility of output and quality which is impossible with horizontals. The quality of gas made can be varied between 520 and 420 B.Th.U. per c.ft., but the corresponding make per ton will range from 13,000 to 24,000 c.ft., for the thermal yield per ton increases with a gradually increased proportion of steaming, up to a certain limit. It has to be remembered, however, that if steaming is increased, the rate of throughput of the coal must be decreased; but the production of the retort in therms will remain constant within limits determined by the nature of the coal, and beyond which steaming is not generally an economical proposition.

The ability to vary the distribution of therms produced in gas or bye-products is of growing importance. Thus, assuming that the declared calorific value is somewhere in the popular range 450 to 500, it is usual to adjust heats and steaming conditions so that the coal gas produced is of about this value. If, however, the commercial value of coke falls, conditions can be readily adjusted in order to obtain a higher yield of gaseous therms, and decrease the yield of therms of the solid bye-product. Similarly, by varying the temperature employed, the tar vapours can be allowed to swell the tar yield, or be cracked to increase the yield of gaseous therms. Thus, while extracting the maximum possible number of therms from the raw material, it is possible to vary the nature of the products to obtain the maximum commercial results.

After this review of what are now generally admitted to be the proved merits of continuous verticals, it is proposed to discuss various points relating to them, which have been, and some of which to many still remain, matters for controversy, together with a few other points which the writer has observed, and which, so far as he is aware, have not been particularly commented upon so far.

Fuel Consumption.

It has sometimes been claimed that the fuel consumption is lower with verticals than with horizontals. To the writer it seems that experience will not bear this out. With an up-to-date horizontal installation at Stretford, on the results of a short trial, it was claimed that the fuel consumption worked out at 10 lbs. of coke used per 100 lbs. of coal carbonized. This, of course, was undoubtedly a favourable instance, against which may be set similar claims made in special cases for continuous verticals. Other horizontal installations, however, have shown a fuel consumption of 12 or 12½ p.ct. Under ordinary working conditions, probably continuous verticals would show an average fuel consumption of 13½ p.ct. At the works with which the writer is connected, careful record has been kept of the weight of coal carbonized, and an endeavour has been made to ascertain the amount of coke used in the producers, by keeping record of the number of skipfuls, and multiplying by an average net weight. In this way it has been found that the figure for fuel consumption usually works out at 15 to 16 p.ct.

Tar Fog.

In the particular installation of which the writer has had experience, some difficulties were met with in dealing with tar fog in the vertical retort gas. It was really a light oil fog, and was very difficult indeed to remove completely. It was found that, even after condensation, wire-drawing through three Livesey washers, and passage through two scrubbers and a rotary washer scrubber, light tar fog still persisted in the gas. It even got beyond the oxide purifiers, and light tar was found in the gauges of the station meters, and was pumped from the syphons on the gasholder connections about a hundred yards away. Unfortunately it was impossible to carry out any detailed investigation when the vertical retort plant was working alone; and when the gas from the verticals is mixed with that from the horizontals at the inlet to condensers, the tar fog difficulty largely disappears, probably because the light vertical tar fog is taken up by the heavier horizontal tar.

Liquid Bye-Products.

(*a*) Experience has shown that continuous verticals give an increased yield of tar, and of a different quality to that produced from horizontals. The specific gravity, free carbon content, and percentages of pitch and naphthalene are all lower, while the amount of light oils is considerably higher. Vertical retort tars are generally more valuable than horizontal retort tars from the point of view of the distiller and chemical manufacturer. For road purposes a different treatment is required. At the tar conference held recently at Manchester under the auspices of the Society of Chemical Industry, it was pointed out that gas undertakings in most counties have no difficulty with regard to the disposal of vertical retort tars and their preparation for road purposes.

(*b*) There is also a greater quantity of ammoniacal liquor produced—owing not so much to a greater amount of ammonia being formed, but to a greater amount being preserved as ammonia.

With continuous verticals there is no stage when the coal mass assumes the temperature of the retort walls, and there is practically no free space, so that the degrading influences are largely eliminated. Even so, however, remembering that NH_3 decomposes at about 800° C., it would appear that at some part of the distillation process this temperature would be encountered, and the unstable compound broken-up. Probably, however, the steaming reaction plays a very important part in

preserving the ammonia and other valuable products formed in two ways:

1. As it involves an absorption of heat, it exercises a cooling action within the retort, and protects the NH_3 from the influence of heat above 800° C.
2. The water gas formed acts as a scavenger, and quickly clears away ammonia formed, and carries it away from the retort before it attains dissociation point.

It has been pointed out, however, that the liquor produced from verticals has two objections: It is often of low strength, and is rich in phenols and tar acids. These two factors are largely responsible for increased difficulties in disposing of effluent liquor from sulphate plants.

At the writer's works these difficulties have been encountered. The verticals produced 40 to 45 gallons of liquor per ton of coal carbonized; the average strength of the liquor being 8 oz. This is not a carbonization problem, however, but one that calls for the improvement of wet purification plant by such devices as acid catch washers, &c.

Repairs.

The repair of a continuous vertical retort under fire is a different problem from the treatment of a horizontal retort in the same circumstances. Satisfactory methods, however, have been worked out; and some of these were dealt with by Mr. W. H. Battersby in his presidential address to the Manchester and District Junior Gas Association in October last.

Usually continuous verticals are not let-down so frequently as horizontal settings, and therefore there are fewer opportunities to effect repairs; but it is usually good policy where possible to let-down settings for inspection and overhauling after about 1000 days' working. Experience has shown that, as the amount of material is less in verticals than in horizontals of the same capacity, the cost of repairs and renewals is correspondingly lower. The wear and tear on the rest of a continuous vertical plant is very small, as there is no heavy and complicated machinery to get out of order. Provided that a suitable lubricant is used, and lubrication is attended to regularly, the life of all parts of the extracting gear is considerable, as the movement is very slow.

Control.

In the early days of continuous verticals, a famous gas engineer expressed it as his opinion that "they were under absolute control, and were less dependent on the human element for operating efficiency." This, however, has not been borne out in practice. With close technical supervision and scientific control, and attendants of ordinary intelligence, the success and superiority of verticals have been demonstrated again and again; but with unscientific management and careless or unskilled workmen, a vertical plant can be rapidly reduced to inefficiency. It is now generally agreed that continuous verticals shift the responsibility from the men in the retort house to the technical staff and management; but modern experience shows that scientific control is as necessary with horizontals, if good results are to be attained. The writer would suggest that in this controversy the vital point is often evaded by advocates of horizontals—namely that whereas (as Mr. Gill and other experts have testified) the maximum control of horizontal retorts only achieves a yield of 75 therms per ton, vertical retorts easily give much better results.

Quality of Coke.

The coke produced from continuous verticals is of excellent quality, and is taken from the coke chambers almost cold. As the coke is practically moisture free, the calorific value per ton is higher than that of horizontal coke. It is therefore preferred by those who have had experience of both.

The coke is well burnt off, is dense and hard, and, unlike horizontal coke, does not tend to become spongy if stored in the open for a considerable period. Being dry and of free burning quality, it is easier to ignite, and burns with less draught. It satisfies the requirements of a first-class smokeless fuel in a suitably constructed grate.

The heat in coke which is usually wasted in the horizontal, inclined, and intermittent vertical systems is utilized in continuous verticals in preheating the incoming secondary air or steam. Some critics have committed themselves to the statement that steaming impairs the quality of the coke, but very little evidence has been brought forward to substantiate this. For appearance, vertical coke would be difficult to beat, while the ash content is as low as, and usually lower than, that of coke from other systems.

The following tests made recently are typical of the quality of coke produced from Glover-West retorts at the works with which the writer is connected.

The combustion chamber temperatures at the time were maintained at about 1300° C.; the average throughput of coal being 2·45 tons per retort per 24 hours. Steam was admitted at the rate (calculated) of 12 p.ct. by weight of the coal carbonized.

Ash	7·70	8·15	10·0
Volatile organic matter	0·91	1·25	2·51
Moisture	0·67	1·21	2·00
Fixed carbon	90·72	89·39	85·49

Coke Handling.

With regard to the handling of coke from vertical retorts, personal experience is perhaps not of particular value, as local conditions vary; but the writer maintains that, in most cases, it would be an easier matter in the case of verticals, for the following reasons:

1. The coke drops out, cold and dry, straight from the coke chamber into the barrow or conveyor, and therefore all difficulties connected with quenching are obviated.
2. The retort bench itself occupies much less ground space, and therefore there is more room left for the stocking or handling of coke.
3. The conveyors are shorter.

Selection of Coals.

Any class of coal can be carbonized in verticals. This claim has been hotly disputed ever since the inception of the new system; and certainly it appeared at one time that it would be difficult to substantiate. Experience has shown, however, that the size and shape of continuous vertical retorts have largely determined the efficiency of working with various classes of coal. A considerable quantity of Durham and other highly-bituminous coals are now carbonized in continuous verticals, chiefly in the Glover-West "New Model" type, the elliptical shape of which has been thoroughly justified. The length of the retort is increased by 4 ft. by adding an expanded steaming chamber at the base, the object of which is to enable the heat of the coke to be utilized to raise the temperature of the steam to dissociation point, and obviate the need for abstracting heat necessary for distillation in the retort itself. In addition, the major axis of the retort is increased by 7 in. to 40 in., and it is so constructed that the increase in the major sides is very gradual, so that there shall be no spaces left between the walls and the coal charge through which undissociated steam might pass.

Moreover, continuous vertical retorts have the tremendous advantage that, at very short notice, carbonizing conditions can be altered to suit a different class of coal without upsetting retort house routine. This is much more difficult with horizontals owing to the fixed carbonizing periods.

In horizontal practice it is very difficult to get the full advantage of easy carbonizing coals without either sacrificing a portion of the output of the plant or else upsetting the retort house routine. The writer contends that it would be more true to state that any class of coal cannot be carbonized in horizontals, because the coke made in the latter is generally discharged by rams, and must, therefore, be of sufficient strength to withstand pushing.

Owing to the rigidity of the horizontal system, it is seldom possible to get the full advantage, and obtain the maximum possible yield, from various classes of coal. Owing to the intermittent nature of the process, it usually happens that part of the coal charge is not thoroughly carbonized, while another part is over-carbonized. With continuous vertical retorts each particle of coal receives practically identical treatment, and passes down through various zones of temperature, to attain thorough carbonization of the whole.

A further important point which seems to have received little attention so far is that there is a much greater difference between the results obtained by continuous verticals from good and from poor coals than with horizontals, and therefore the selection of coal for verticals is more remunerative. In a representative instance it was found that, by using good-class gas coal in place of medium-class in horizontals, the yield was increased from 65 to 72 therms per ton, or an increase of 11 p.ct. With a similar substitution in verticals, the results obtained went up from 70 to nearly 90 therms per ton, or about 30 p.ct. increase.

Use of Blended Coals or Mixtures.

Everything points to the fact that, in view of the depletion of gas coal reserves, it will be necessary in future to utilize mixtures of gas coal with classes of coal poorer in volatile constituents. There is need for considerable investigation here to determine the correct proportions of the mixture, as the amount of binding material present in coal varies considerably. It would be necessary to add just enough poor coal to take up from the richer coal the excess of binding material which acts as a cement on decomposition, and, by filling up the interstices between the particles of the whole, produces a bright, hard, coke. By the use of suitable mixtures, much better results will be obtained by verticals, chiefly because the gas yield will also be improved if the correct temperature and conditions obtain, whereas in the horizontals the improvement will be practically confined to the coke.

Capital Costs and Costs of Maintenance.

It is not easy to obtain or compare figures for capital costs of retort installations; but those advocates of horizontals who have maintained that the capital cost of a horizontal installation is lower than that of a vertical, forget the important factor that the facilities provided are also proportionately lower. If the two systems are compared on the basis of output of therms per day, the balance would probably be usually with verticals. On the question of maintenance costs, the writer is not at liberty to

give figures, but the following were submitted by the various engineers concerned, in May, 1923:

Maintenance costs of horizontals at Ormskirk for the period 1912-23	11·25d. per ton
Maintenance costs of horizontals at Harrogate over the period 1915-22	13·73d. " " (corrected to prices ruling in 1915)
Cost of all repairs and renewals of horizontal and inclined retorts at Halifax—	
For 5 years ended March, 1917	10·27d. per ton
" " " 1922	15·87d. " "
Maintenance cost of the Glover-West vertical retort plant at Droylsden, Manchester, over the period 1910-21, including the cost of a complete resetting	9·162d. " "
Cost of maintenance and repairs to retorts of Glover-West vertical retort plant at Thornton Road, Bradford, over the period 1912-1923	4·40d. " "

NET COST OF PRODUCTION.

From the financial aspect of production, the economy effected by the adoption of continuous verticals is further shown by consideration of the following data compiled from statistics given in the "Gas World" Analyses of Accounts:

1924; average of 47 companies—	
Net cost into holders	5·13d. per therm
Average of the 8 companies using continuous verticals, partly or wholly—	
Net cost into holders	4·87d. per therm
Corporation undertakings, 1922-23. Average of 69 undertakings—	
Net cost into holders	20·74d. per 1000 c.ft.
Average cost of the 12 undertakings using verticals—	
Net cost into holders	19·18d. per 1000 c.ft.

In view of these figures, coupled with the various other advantages previously enumerated, it is not difficult to account for the swift advance of continuous verticals.

At such works as Cardiff, Newcastle, Dublin, Northampton, Coventry, Leicester, and many others, horizontals with modern equipment have been superseded by verticals. It is significant that the Gas Light and Coke Company, after considerable experience of various types of horizontals with the most modern and efficient stoking machinery and coke handling plant, have, during the last few years, given four large contracts for continuous verticals. Three of these contracts placed in the last two years have a guaranteed capacity of 23 million c.ft. per day.

SUMMARY OF CONCLUSIONS.

From this survey we can sum up the advantages of carbonization in continuous verticals as follows:

1. Improved yield of gaseous therms, tar, and liquor.
2. Considerable saving in ground space, coal used, and labour required.
3. Improved quality of coke.
4. Gas of constant calorific value, specific gravity, and composition.
5. Heat in the coke is utilized.
6. Reduction of impurities.
7. Better working conditions.
8. Any class of coal can be carbonized, and conditions can be changed at very short notice to suit different coals or mixtures.
9. Flexibility, and ability to vary the proportions of the total number of therms produced in the solid, liquid, and gaseous forms.

It is the writer's contention that no type of horizontal retort can possibly give such a combination of advantages, and that the complete supersession of the old system by the new is now only a matter of time. In this thesis, an endeavour has been made to show that most of the criticisms levelled at continuous verticals have not been substantiated as experience has increased, and that by the continued application of scientific knowledge any drawbacks remaining will soon be surmounted.

In conclusion, the writer desires to express his sincere thanks to his Chief, Mr. D. H. Helps, A.M.Inst.C.E., for permission to publish the figures, experiences, &c., given in this thesis.

Discussion.

The PRESIDENT observed that the author was obviously a firm believer in verticals. His contribution would be of great benefit to those on the engineering side of the industry; and doubtless many members of the Association would desire to ask Mr. Miles various questions.

Mr. D. CLEAVE CROSS (Lea Bridge) asked if the verticals at Reading were of the modern type with the bottom steaming chamber. Mr. Miles had stated that one of the advantages of the vertical system was that any type of coal could be carbonized. On this point he would say that during the coal strike they endeavoured unsuccessfully to carbonize Westphalian coal. He thought that the advocates of vertical retorts made a mistake when they claimed that with this type of carbonizing unit they obtained more therms of gas per ton of coal than they could with horizontals. It had to be remembered that the greater yield of gaseous therms was due to steaming; and it was wrong to compare two different conditions. The author had suggested that scurf formation in vertical retorts was lessened by the friction of the descending charge. He (the speaker) did not agree with this statement. His own experience indicated that scurf formation depended on the quality of the gas made and the amount of steaming, and that friction made no difference.

Mr. J. H. GOLDSMITH (Hon. Secretary) thought that, while verticals had more advantages than disadvantages, the steam admitted had to be taken into account when comparing thermal yields with those from other forms of plant. A vertical unit combined a coal gas plant and a water gas plant. Many large undertakings were renewing their horizontals—the Association had seen what the South Metropolitan Gas Company were doing in this respect when they visited the Company's East Greenwich Works in January. Mr. Goldsmith asked the author whether, in his figures for gas make, which had been corrected to 60° Fahr. and 30 in. Hg., he had also taken into account the pressure drop in the meters. Regarding coke, verticals had the advantage that the coke discharged from the retorts was practically cold; and this might assist the grading operation, in which difficulty was experienced with semi-wet horizontal coke. Had Mr. Miles any experience of the grading of horizontal and vertical cokes?

Mr. E. R. WILLIS (Gas Light and Coke Company), regarding the author's statement that any type of coal could be carbonized in verticals, asked Mr. Miles whether he had experience of coals containing a large percentage of fines. He (the speaker) understood that these had a tendency to hang-up in the retort. Nuts of about 1½ in. were found to travel much better.

Mr. P. C. GARDINER (Tottenham) said he was sceptical about the idea that every variety of coal could be successfully carbonized in verticals. Last year, when the Association visited Portsmouth, it was learned that difficulty had been experienced there with Durham coal. Verticals did not possess the advantage of lower fuel consumption per ton of coal carbonized. Regarding the blending of coals, it seemed that coals had to be blended to suit the plant, rather than that the plant could be adapted to carbonize any desired blend.

Mr. W. T. KENSHOLE (Lea Bridge) remarked that the quality of the coke made in verticals depended mainly on three factors—the size of the coal, the temperature of carbonization, and the amount of steaming. Regarding the first, larger coals appeared to produce smaller coke; and in general, the higher the temperature of carbonization, the smaller the coke and the more the dust. As for the influence of steaming, with ordinary crushed coal moderate steaming had hardly any effect; but with large coal the dust was increased. Of course, the appearance of vertical coke was much better than that of horizontal. A difficulty experienced with Glover-West installations was the amount of dust which flew about when the retort was discharged. The Woodall-Duckham plant was better in this respect.

Mr. MILES, replying to the discussion, said he agreed with the last speaker that three factors influencing the coke were the size of the coal, the temperature of carbonization, and the amount of steaming. He agreed, also, that with the Glover-West setting there was trouble from dust, but this was not so serious as with horizontal settings. In reply to Mr. Cleave Cross, the Glover-West retorts at Reading were of the old pattern, with no steaming base. He thought that his statement that all classes of coal could be carbonized in vertical retorts would "draw fire." As a matter of fact, though, during the strike a mixture of Durham and Westphalian coal was carbonized at the Torquay Gas-Works without trouble. Perhaps he should have qualified his statement to read "all classes of English coal." Regarding scurf formation, he still considered that friction of the descending charge lessened the amount. Mr. Goldsmith had drawn attention to the fact that the South Metropolitan Gas Company were rebuilding their horizontal retorts. It must be conceded, however, that the South Metropolitan were unique; and if it were possible for them to adopt a standard calorific value of (say) 500 B.Th.U. without great additional expense, they might do so. The Fuel Research Board had recently carried out a series of tests on vertical retorts making a straight coal gas of 550 B.Th.U. per c.ft.; and results showed that verticals were more efficient than horizontals for the making even of a rich gas. With regard to Mr. Goldsmith's query about meter pressure, this had not been taken into account in correcting the make of gas to the figure given in his paper. He agreed with Mr. Willis that, for verticals, nothing was better than 1½ in. nuts. Two classes of Yorkshire nuts, in size from 1¼ to 2 in., were used at Reading. Fines did present a difficulty in that they sometimes tended to hang-up the coal. He had found this during the strike when carbonizing American coals containing a large percentage of fines. It had been necessary to rod-down the charge. Mr. Gardiner had raised the question of the carbonization of Durham coal in verticals. Well, at Torquay they were at one period carbonizing Durham coal without difficulty. He still maintained that, provided conditions were suitably adjusted, practically all types of coal could be carbonized in verticals. On the matter of fuel consumption, verticals did not show any advantage, though large settings gave excellent figures.

Mr. J. H. GOLDSMITH then read his thesis on "Some Points in the Design and Operation of Horizontal Retort Settings."

A vote of thanks to the authors was proposed by Mr. KENSHOLE, and seconded by Mr. GARDINER.

Prague New Gas-Works.—A significant sign of the progress of Prague, says "West's Gas," is the complete new gas-works which have been constructed on the outskirts of the city. The carbonizing installation of this works, which is the most modern in Central Europe, consists of ten settings of the latest type of Glover-West vertical retorts. La Cie. pour la Fabrication des Compteurs, of Paris, have carried out the complete contract; and much of the work has been executed by Czecho-Slovakian engineering firms. The undertaking may, therefore, be described as international; and it speaks well for the co-operation of the various parties that the works were put into operation within the specified time, and to the satisfaction of all concerned.

SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).

Much useful information regarding iron and steel was contained in a paper read by Mr. Robert Fife, of Kilmarnock, at this meeting. He prefers cast-iron pipes cast in green sand to those cast in dry sand, for the former, he states, are better able to withstand corrosion. The addition of copper to cast iron greatly enhances its corrosion-resisting properties.

A Meeting of the Western District was held on March 19 at the Royal Technical College, Glasgow—Mr. James Hall, President, in the chair.

The Chairman intimated that the postponed visit to the "Glasgow Evening News and Daily Record" office would take place on March 30.

METALS USED IN GAS-WORKS PRACTICE.

By Robert Fife, of Kilmarnock.

[Extract.]

Some time ago the Institution of Gas Engineers appointed a Committee to investigate the quality of wrought-iron tubing as supplied to the gas industry. The report thereon, published in the "Gas Journal" for July 22, 1925, is both interesting and instructive. A decision was made to draw up a specification whereby managers may be assured of getting a purer and more durable metal. The subject of metals has lately been engaging the attention of many leaders of our industry; and it behoves us as juniors to pay heed to their activities.

In accordance with the recently-published specification of the Institution of Gas Engineers, wrought-iron tubes, after having been screwed, must withstand internal hydraulic pressures as follows:

Gas tubes	500 lbs. per sq. in.
Water tubes	600 " " "
Steam tubes (to 2 in. dia.)	700 " " "
Steam tubes (over 2 in. dia.)	1000 " " "

The pneumatic pressure test, under water, for soundness of tubes and gas fittings, as practised by the Glasgow Gas Department, is a searching test, and might be profitably used by many smaller undertakings.

The coating applied to cast-iron pipes consists usually of dehydrated tar, or pitch and heavy tar oil, such as green oil or anthracene oil; and the pipe, as soon as possible after testing, should be dipped in this mixture, and kept there until the whole reaches a temperature of 300° Fahr.

Wrought Iron.—A good wrought iron should contain less than 1 p.ct. of impurities, usually present in the form of slag. The limits for manganese and sulphur as specified by the Institution of Gas Engineers are 0·15 p.ct. and 0·03 p.ct. respectively.

The better resistance to corrosion of wrought iron than steel is probably due to the nature of the slag formations in the iron acting as a protective coating, while the more homogeneous steel, containing little or no slag (and that in the form of globules, if present) has not this property of resistance.

During the past three years we have had considerable trouble in Kilmarnock with corrosion of our wrought-iron gas services. Our cast-iron pipes seem to be almost immune from corrosion except where chemical refuse, such as ashes, is in contact with the main. The soil in Kilmarnock is a clay of a very close texture when beaten, while the sub-soil is mostly gravel, which allows a good drainage for any water percolating downwards. There are gas and water cast-iron mains which were laid sixty to seventy years ago in Kilmarnock, and are still in excellent condition. Considering this, and also the fact that the corrosion trouble with the wrought-iron services is of recent occurrence, one is inclined to put the onus on the quality of the tubes. Last year we renewed about sixty wrought-iron services which were wasted from end to end with corrosion, both internal and external, of an active nature. I think, therefore, that the newly published specification for wrought iron has come none too soon—if it will bring the makers up to the mark, and eliminate this evil.

In laying new mains, if we find that the ground has been made up with ashes or any such refuse, we always take care that the main itself is well bedded round with clean soil. At present we are specifying for the installation of a new gasholder, to be used as a water gas storage, or relief, holder. It has been decided to employ wrought iron in preference to steel plates, as an added protection against the severe corrosive action of the foul water gas.

Steel.—A soft steel contains 0·05 to 1 p.ct. of carbon; mild steel 0·1 to 0·25 p.ct.; medium steel 0·26 to 0·40 p.ct. With higher percentages, up to 1·5 p.ct. of carbon, the steels are classed as hard and tool steels.

There is no need to emphasize here the adaptability and superiority of gas-heated furnaces for the heat treatment of steels. Speed, varying temperatures, heating out of contact with the fuel or atmosphere, and economy are the essentials; and gas furnaces are meeting those demands successfully.

Steels, not heat treated, containing less than 0·89 p.ct. of carbon consist of ferrite (soft iron) and pearlite (a laminated mixture of ferrite and carbide of iron—Fe_3C, called cementite). Pearlite usually appears in curved or wavy lines, not unlike a finger print. Steel of 0·89 p.ct. carbon consists entirely of pearlite. With steels of over 0·89 p.ct. carbon, the structure is of cementite and pearlite. The higher the percentage of carbon, the greater will be the proportion of cementite.

The high-temperature constituent of carbon steel is austenite. A very hard and strong structure, called martensite, is the usual constituent of hardened steel, and is the first transformation of the austenite into the lower-temperature constituents. Tempered steels show other constituents of this transition type—viz., troostite and sorbite.

Tensile Strengths of the Various Constituents.

Ferrite	50,000 lbs. per sq. in.
Pearlite	125,000 " " "
Cementite	5,000 " " "

Hardness (ferrite = 1): Pearlite, 4·3; troostite, 88; austenite, 104; martensite, 239; cementite, 271.

As the percentage of carbon in steel increases, the steel becomes stronger and less ductile, and also less easy to weld. The British Standard requirements for structural steel are a tensile strength of between 28 and 33 tons per sq. in., and the elongation for steel of 0·375 in. thickness, and upwards, not less than 20 p.ct., and for steel under this thickness, not less than 16 p.ct., on 8 in. Therefore, where both strength and ductility are required, such as for structural purposes, the steel will be of a low carbon content. For tubing, those which are welded require to be low in carbon (0·1 to 0·18 p.ct.), while the weldless tubes may contain a higher percentage of carbon (0·2 to 0·4 p.ct.), and are correspondingly stronger. Sulphur is one of the unavoidable but objectionable constituents of steel. It should not exceed 0·08 p.ct.

Cast Iron.—Cast-iron pipes for gas, which are often specified to be cast in dry sand, should be cast in green sand, thereby giving the surface of the pipe a finer grain and a better resistance to corrosion. The green sand castings are also cheaper; the current price being about 45s. per ton less than dry sand castings. Adding various percentages of copper and tin towards increasing the resistance of cast iron to corrosion was tried. All the results obtained were in favour of the alloys treated with the copper. Even a good quality of iron was more severely acted on than a poor quality which had been treated. On testing varying proportions (from ¼ to 1½ p.ct.) of copper in iron, no contradictory results were obtained; but from the point of view of economy and efficiency, the ½ p.ct. copper alloy seemed best. On exposure to atmospheric conditions for prolonged periods, the treated samples proved easily superior as corrosion registers. The addition of copper gives a closer grain to the cast iron, and increases its tensile strength. Where an engineer is experiencing trouble with corrosion of cast iron, or even of steel, pipes, a few lengths of either metal alloyed properly with about ½ p.ct. copper would, I am sure, be worth a trial.

Protection of Metals.

For a number of years we have been using graphite paint in Kilmarnock, with satisfactory results, for the protection of our gasholders and other structures. This paint is a specially-prepared graphite mixed with pure linseed oil and suitable driers. It contains no lead, and so is unaffected by sulphuretted hydrogen. The holders are scraped and painted every two years, and every alternate year they are patch-painted—*i.e.*, any defective portions are scraped and touched up. The standards, girders, wind ties, &c., are painted every four years. Except for a few isolated patches, particularly on the crowns, the holders are in good condition, despite their ages, which are 25, 30, and 65 years respectively.

As a boiler compound we use in our Lancashire boilers a mixture of plumbago—graphitic carbon 70 parts, and soda ash 30 parts. When filling up the boiler after cleaning, we usually wash over the inside with a plumbago and water wash, or spread some dry plumbago on the bottom. As the water rises, this material floats, and is spread over the inside of the shell. About 1 lb. per boiler per day is used. This treatment has always prevented any hard scale from adhering to the boiler, and seems to prevent pitting.

The Chairman thanked Mr. Fife for his paper, and Mr. McIntosh (Kilmarnock) suggested that more attention should be given to the specifications of the Institution of Gas Engineers. Mr. Gordon observed that he had experienced trouble with pipes cast in green sand.

Sir Frederick Green, K.B.E., who at the time of his death last month was Deputy Chairman of the Commercial Gas Company, left unsettled property of the gross value of £338,066, with net personalty £321,875.

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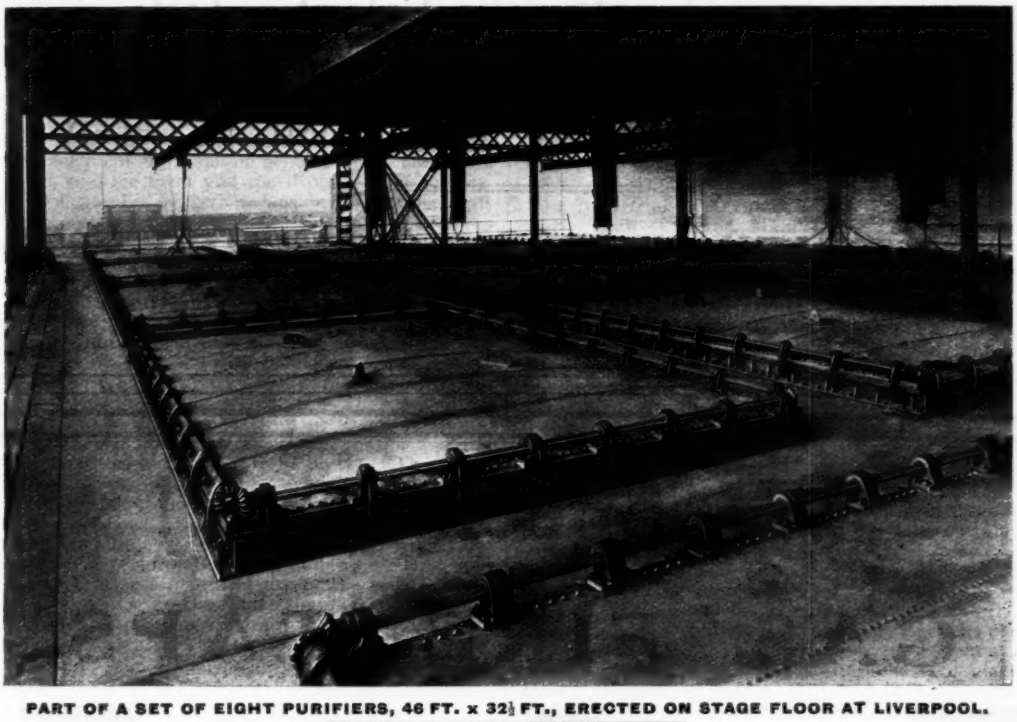

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SCIENTIFIC AND INDUSTRIAL RESEARCH.

Report of the Committee of the Privy Council for 1925-26.

The eleventh annual report of the Committee of the Privy Council for Scientific and Industrial Research, which covers the period from Aug. 1, 1925, to July 31, 1926, was issued a few days ago by H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2, and Branches, at the price of 3s. net, postage extra. Further activity is foreshadowed by the statement that during the period referred to the Committee have received recommendations from the Advisory Council on the programme of research for 1926-27, for which, and for administrative services, they have drawn up estimates amounting to £442,877, as compared with £380,263 for 1925-26, and £328,281 for 1924-25. The Committee feel that the report of the Advisory Council shows there is still much to be done before the industrial position is re-established; but it records with no less emphasis how much has already been achieved. To look back over the last ten years, they add, is full of encouragement for the future, if the efforts already made can be continued and increased. The existing arrangement with the British Refractories Research Association of a grant on the original basis of pound for pound is being continued for another year.

Low-Temperature Carbonization.

Some mention is made of the report of the Royal Commission on the Coal Industry; and special attention is drawn to the remarks on the present position of low-temperature carbonization of coal. As to this matter, the Committee state that the question of Government aid for the development of methods for the low-temperature carbonization of coal has again been under consideration. The Committee's view is that the proper duties of the Department are to obtain general technical data on the subject, and to place them and the experience of the Department at the disposal of all serious workers on the problems involved. The question of the assistance that can be given to the development of privately-owned plants is, they say, a difficult one. Before a system can come into successful use on a large scale, there are certain definite stages that must be passed through. The idea is first proved on a small scale; and then on an intermediate scale so that data may be obtained for the design of a full-sized unit. The unit plant is then worked and studied to form as close an idea as possible of how a commercial plant is likely to work, from both technical and commercial points of view. It is, however, only after a plant of considerable size, embodying probably many "unit" plants, has been in operation under commercial conditions for a period of years, that its success can be said to be proved. There are, it is added, several systems that have reached the stage of the erection of a "unit" plant or something closely approximating thereto; and, in accordance with the offer made by the Government two years ago, the Department have already carried out tests on the technical performance of five of these plants, and have published reports on four out of five of the tests. These reports express no opinion on the future commercial possibility of the plant tested, as success can only be proved by long-continued steady working. The Committee consider that assistance in the commercial development—*i.e.*, in the final stage mentioned above—is not in any case one for the Department.

National Fuel and Power Committee.

The Committee fully concur with the view of the Royal Commission on the Coal Industry as to the desirability of a survey of the heat, light, and power requirements of the country. They say: "General efficiency has undoubtedly suffered in the past from a lack of co-operation between the various industries supplying heat, light, and power, or between industries using large quantities of heat and those requiring power. It is impossible to say, with all the information at present available, what economies are really feasible; but they should be considerable. Accordingly, we desire to record our satisfaction at the establishment of the National Fuel and Power Committee; and we entertain the hope that the deliberations of this body will produce results of lasting benefit."

Fuel Research Board.

The report of the Fuel Research Board for 1925, which was issued a few weeks ago (and noticed on p. 140 of the "Journal" for Jan. 19), covers a portion of the period dealt with in the report of the Advisory Council for Scientific and Industrial Research, which is issued as part of the document now under review. As to the work of the Board, the Advisory Council say that every industry has its own fuel problems, which, if the units of the industry are not large enough for industrial research on a sufficient scale, should be attacked co-operatively. It would be difficult to name any type of investigation which offers more chance of immediate financial returns than that of fuel economy. The Council wish to emphasize the necessity of a systematic and continuous policy; for it is only by continuity of policy that the right type of scientifically trained men will be available. Important though they believe the work of the Fuel Research Station to be, it can, they recognize, never touch more than the fringe of the field which should be explored by the industries of the country. Its success will be measured largely by its effect in stimulating and assisting research elsewhere, and by its capacity to look ahead beyond the immediate requirements of the country. It is, the Council think, possible that, in spite of the public interest which has been taken in the work of the Fuel Research Station, many people do not realize the scale on which experiments are, of necessity, carried out.

For some years now the Council have watched with interest the effect on private enterprise of the large-scale industrial research undertaken at the Fuel Research Station. They have every reason to believe that, far from acting as a deterrent, it has stimulated and assisted independent efforts. All the results have been communicated freely to technical men in industry who are engaged on similar work; and some of the results of the work on the economic production of gas by slight modification of standard processes have already been widely applied in industry. They attribute much of the influence the work has had to the accuracy with which it has been carried out on the large scale.

Carbonizing Coal at 625° C.

Summarizing the work of the Fuel Research Board, the Advisory Council, of course, refer to low-temperature carbonization, and mention the two new retort settings alluded to in the report of the Director of Fuel Research (Dr. C. H. Lander) for 1925. One of these settings has given most promising results. This consists of two cast-iron retorts 21 ft. high; the internal cross-section being 6 ft. 6 in. by 7 in. at the top, and 6 ft. 10 in. by 11 in. at the bottom. The retorts were started-up in December, 1925; and for the first three months the temperature did not exceed 600° C. At the beginning of April, however, it was raised to 625° C., and fairly satisfactory results were obtained using a blend of coals; but the tar yields were rather low.

In June trials were made using unblended medium caking coals. Both "Dalton Main Nuts" and "Garforth Nuts" were tried; and in each case the coal was clean, sized coal. The retorts were worked by withdrawing coke at intervals of one to two hours, the coal remaining quiescent in the retort during the intervals. With "Dalton Main" coal and a throughput of 7·3 tons per day, the yields per ton were: Gas, 37·3 therms (calorific value 719 B.Th.U.); tar, 16·7 gallons. (per ton of coal as charged); coke, 15·14 cwt., of which 83 p.ct. remained on a ½-in. sieve. With "Garforth Nuts" the yields were: Gas, 35·5 therms (calorific value 577 B.Th.U.); tar, 16·3 gallons (per ton of coal as charged); coke, 12·9 cwt., of which 81 p.ct. remained on a ½-in. sieve. In both cases the coke was an excellent smokeless fuel, igniting readily, and giving a good fire in a domestic grate. The throughputs could probably have been increased. The retorts worked without any trouble. When the stocks of these coals were exhausted, an attempt was made to use "Mitchell Main Gas Nuts"—an evenly sized, but strongly caking, coal. The coal was first preheated in a slightly oxidizing atmosphere. The throughput was 8½ tons per day. The result was an excellent lump coke (11 p.ct. fines passing a ½-in. screen), and a yield of 15·2 gallons of tar per ton of coal as charged. The retorts gave no trouble at all. Since then the coal has been used without preheating, and so far with equally satisfactory results. It is too early yet to say how far these results point to a real solution of the problem; and it is not possible to state at present whether the satisfactory results are due to the type of coal used or to the method of semi-continuous working adopted.

Low-Temperature Tar.

The study of the characteristics of low-temperature tar has been continued, both at the Fuel Research Station and at the Chemical Research Laboratory at Teddington; the latter being concerned primarily with the elucidation of the chemical constituents in the tar, and particularly of those which may be of commercial value for purposes other than as fuels. One investigation at the Fuel Research Station has dealt with the influence of the temperature of carbonization on the tar. A series of samples of the same coal has been carbonized in the horizontal steel retorts under precisely similar conditions, except as regards the temperature, which was varied from 400° to 700° C. in the different experiments, by steps of 50° C. The yields in each case were noted; and a detailed examination of the tars produced has been made.

Research on Illumination.

Mention is made of the inquiry into the particular conditions affecting compositors' work, which is being undertaken as part of the investigation of the nature of the illumination required for difficult factory processes. The advice of the Illumination Research Committee has been sought upon various problems affecting the adequate lighting of picture galleries. The investigations undertaken for the Illumination Committee of the British Engineering Standards Association have been continued; and a further important inquiry into the relation between glare and visibility in street lighting has been put in hand. A report on the light distribution of certain widely-used enamelled steel reflectors for industrial lighting has been pub-

lished. Another report which has been issued defines the terminology of illumination.

ATMOSPHERIC POLLUTION.

Towards the end of 1925, the Department were asked by the Air Ministry to accept responsibility for the work on atmospheric pollution at present carried out by the Meteorological Committee with the assistance of the Advisory Committee on Atmospheric Pollution. The limited funds at disposal have restricted the research into the effects of atmospheric pollution and new methods of its prevention. The suggestion made was that the work might be more effectively carried out if the research could be developed in association with the work of the Fuel Research Station, and the investigations of the Building Research Station into the decay of stone used in buildings. The Advisory Council of the Department recommended that if subscriptions of not less than £500 per annum were forthcoming from local authorities and industrial concerns interested in the prevention of atmospheric pollution, sums not exceeding £500 a year should be provided by the Department; and that the Government share in the work should be organized under the supervision of a small Research Committee of the Department. The necessary funds have been promised, and proposals have been made to carry out this recommendation.

CYANOGEN PURIFICATION.

In "Das Gas- und Wasserfach" for Feb. 19, Dr. Robert Mezger, of the Stuttgart gas undertaking, discussed modern requirements as to the purity of town gas. The following are a few points from his article, in which he adduced, with the help of working results, the payability of separate cyanogen washing, apart from the other advantages of the complete elimination of this compound.

Considerable anxiety had been experienced a few years ago at Stuttgart owing to an exceptionally high cyanogen content in the gas, averaging 24 grammes HCN per 100 cub.m. [105 grains per 1000 c.ft.]. Fears of serious corrosive effects upon the two large holders, as well as other apparatus, mains, services, and consumers' apparatus, were accentuated by the discovery of the internal condition of a tank in the benzole plant. Benzole recovery precedes sulphur purification at Stuttgart, and the tank in question, after five years in use, was found to be encrusted inside with solid corrosive matter weighing 1300 kilos. [about 1·3 tons]. The rust-like substance analyzed as:

Prussian blue	23·1 p.ct.
Oxide of iron Fe_2O_3	37·6 ,,
Sulphur	9·37 ,,
Organic matter	25·76 ,,

The seriousness of the matter will be appreciated from the fact that the total weight of metal in the tank when new was 7·2 tons; and 475 kilos. [nearly half-a-ton], or 6·6 p.ct. of the total iron, had been dissolved-out and converted into forms such as give rise to what is known as corrosion.

The urgent necessity of introducing wet cyanogen purification was realized. The main part of Dr. Mezger's article is devoted to estimates of the payability, apart from the corrosion question, of cyanogen washing, in which profit and loss accounts, on the Stuttgart results, are worked out in considerable detail for dry sulphur purification alone, for cyanogen washing, and for the two in combination. A distinct case is made out in this way in favour of the introduction of the cyanogen plant. However, the advantages of the complete elimination of cyanogen from the gas have been so striking that he would have no hesitation in introducing it in another similar instance, even if the slight balance of direct profit was against it. In this statement, the fact is not overlooked that the introduction of vertical retorts and chambers has considerably reduced the quantity of prussic acid in the crude gas, and that it reduces the iron ferrocyanide concentration in the cyanogen sludge to 8 or 9 p.ct., against the 14 p.ct. or more obtainable previously. Even so, it is a valuable bye-product, and a price of 40 pfennig per kilo. is obtainable, against only 30 pfennig when it is sold in spent oxide; and often in the latter it is not present in large enough quantities to be saleable at all.

The author, in the course of his article, stresses the importance of the recent movement for a maximum purity of gas supply, both for the reliable working of industrial and household appliances and for the protection against corrosive damage of plant, mains, and fittings. He refers to recent proposals from America that this end might be attained by a partial drying of the gas by cooling and by chemical processes. He cannot see great prospects in this, unless the drying can be complete. At present, requirements can be better satisfied by attention to four main points. First, there should be practically no oxygen present in town gas. Secondly, sulphuretted hydrogen extraction must be as complete as possible. Thirdly, the extraction of naphthalene must be provided for in a liquid form which gives rise to no disturbances. And fourthly, all traces of cyanogen must be removed.

In support of his advocacy of wet cyanogen purification, he maintains that little more than half of the original hydrocyanic acid in the gas becomes combined in the form of prussian blue in the oxide purification process. For the rest, it is partly lost in the crude liquor, and partly forms harmful constituents in the gas, a very small proportion remaining in sulphocyanide form in the purifiers.

Mr. SYDNEY YARRELL SHOREBRIDGE left estate of the gross value of £17,592.

COAL AND BYE-PRODUCTS EXPORTS.

Board of Trade Returns.

THE Board of Trade Returns relating to the exports and imports for February show that the coal export trade continues to pick-up in a remarkably fine manner, but at prices which average, including all classes of coal, well under £1 per ton. Gas coke is also gaining in quantity, though at a fairly low price. On the other hand, metallurgical coke is in very poor case. Liquid products and sulphate of ammonia are also weak.

COAL EXPORTS.

In February, the total quantity of coal exported amounted to 4,172,856 tons, the value being £3,982,682. In February, 1926, the quantity was 4,340,006 tons; the value being £4,025,627. In February, 1925, the amount was 4,344,008 tons; the value being £4,537,746. In these totals, gas coal last month amounted to 519,938 tons, of a value of £453,215, which averages 17s. 5·2d. per ton. In February, 1926, the quantity of gas coal exported was 543,413 tons; and in 1925, 568,966 tons—the respective values being £438,309 and £584,412. Combining the first two months of the year, the total amount of coal sent abroad was 8,265,735 tons; in the same period of 1926, 8,488,048 tons; and in that of 1925, 8,710,059 tons—the values being: 1927, £8,273,488; 1926, £7,846,963; 1925, £9,246,724. Of these figures, gas coal represented, in January and February, 1,076,848 tons; in the corresponding period of 1926, 1,105,929 tons; and in that of 1925, 1,120,742 tons—the value being: 1927, £980,331; 1926, £898,144; 1925, £1,157,130.

GAS COKE.

Regarding gas coke, the quantity shipped in February amounted to 66,022 tons; February, 1926, 119,895 tons; and February, 1925, 41,714 tons—the values being: February, 1927, £77,849; 1926, £126,884; and 1925, £63,807. The average value per ton last month was £1 3s. 6·9d. Taking January and February together, the quantity of gas coke sold abroad was 121,807 tons; 1926, 257,646 tons; and 1925, 105,520 tons—the values being, 1927, £146,182; 1926, £266,716; 1925, £163,685. Metallurgical coke only figures for 55,069 tons in the first two months of this year, compared with 204,237 tons in January and February, 1926, and 240,169 tons in the same period of 1925. The values of these quantities were: 1927, £87,938; 1926, £229,883; 1925, £326,111.

TAR PRODUCTS SHIPMENTS.

Coming to tar products, during February only 317 gallons of benzole and toluole were exported, compared with 18,565 gallons in February, 1926. The total for the first two months was 19,178 gallons, as against 376,092 gallons in the corresponding period of last year. Naphtha last month was only represented by 5285 gallons, compared with 15,684 gallons in February, 1926. For the two months 6573 gallons were exported, as against 34,047 gallons in the same period of 1926. The business abroad in tar, oil, creosote, &c., last month was only 282,987 gallons, as compared with 3,823,610 gallons in February, 1926. For the two months, the total this year stands at 1,697,010 gallons, as against 8,472,094 gallons in the same months of 1926.

SULPHATE OF AMMONIA.

The market abroad for sulphate of ammonia is still in a weak condition. The total quantity sent abroad last month was 11,053 tons, compared with 20,298 tons in February, 1926. For the two months, only 19,567 tons were shipped, as against 43,084 tons in the corresponding period of last year.

GAS OIL IMPORTS.

Apparently the demand for gas oil still continues at a high level. In February, 10,895,854 gallons were received, compared with 6,243,084 gallons in February, 1926. In the past two months, 27,068,007 gallons were imported, as against 8,580,157 gallons in the same period of last year.

GLOVER-WEST RETORTS AT SILKEBORG.

[Extracted from "West's Gas."]

At Silkeborg, in Denmark, both the gas-works and the electricity works are controlled by the Corporation. The former were built in the year 1856 by English engineers. During the difficult coal situation occasioned by the war, the Silkeborg Gas-Works were at times forced to carbonize mountain pine-wood and peat. Under normal conditions, English gas coal from the Durham district is carbonized almost exclusively.

After preliminary investigations and visits to various Scandinavian gas-works, it was decided in 1925 to erect a modern continuous vertical retort plant, and West's Gas Improvement Company were commissioned to build an installation of 11,000 cub.m. daily capacity. In choosing the most suitable system, the following considerations had to be taken into account. The plant should be adaptable to a restricted ground space, carbonizing units must respond to the fluctuating daily and annual consumption, and the coke produced must be of a quality saleable as household fuel—coke being the principal source of interior heating in Denmark. Further, it was important that gas of a consistently good quality should be produced, despite the fluctuating quality of the coal obtainable in difficult periods, to compensate for a necessarily higher purchase price.

The above information has been kindly contributed by Mr. A. Pedersen, the Engineer and Manager at Silkeborg. It is of particular interest at the present moment, because this installation is a good example of a comparatively small plant carbonizing Durham coals. The plant consists of eight "New Model" retorts, four of which have been in regular action since November last; the whole of the town's supply being made by the Glover-West vertical retorts. Over that period the make has averaged 14,500 c.ft. per ton, and the calorific value 520 B.Th.U. The plant is operated by one man per shift, who also attends to the boiler, steam engines, and gearing, and to the gas engines and electrical generating plant on the afternoon shift.

The flexibility of the Glover-West vertical retort has enabled the varying demands of the town to be met with a constant quality, in spite of the fact that the gasholder capacity is considerably less than a day's make.

Low-Temperature Carbonization.

Mr. F. S. Sinnatt, M.B.E., M.Sc. (Tech.), F.I.C., was the lecturer on Monday of last week in the course on "Modern Developments in Regard to Fuel" at the Sir John Cass Technical Institute, Jewry Street, E.C. Mr. Sinnatt, who is connected with the Fuel Research Board, dealt with the subject of low-temperature carbonization; but he remarked that any views he might express would be entirely unofficial. As indicating the extent of the field open to smokeless fuel, he said that the amount of coal used for household purposes seemed to be increasing, in spite of the progress made by other methods of heating and cooking. Low-temperature carbonization could quite easily deal with the 40 million tons of coal consumed for domestic purposes; and, in addition, there appeared to be no reason why some of the coal employed in manufacturing operations should not be so carbonized. There were, as a matter of fact, close upon 120 million tons of coal per annum which constituted the field for the low-temperature carbonization process. The coal that was now used in the gas industry round London totalled 4½ million tons per annum; and if it was desired to deal with this quantity by a process of low-temperature carbonization, it would be necessary to have an organization not much smaller than these undertakings. The capital of all the gas companies in and round London, he believed, was something like £53,000,000; but even dividing it by two, and calling it in round figures £25,000,000, to carbonize 4½ million tons of coal a year, and multiplying this by eight or ten, some idea would be gained of the amount of money that would be required to deal with 40 million tons of coal.

English and German Coals—A Comparison.

"Das Gas- und Wasserfach" for March 19, quoting from the "Deutsche Bergwerks-Zeitung," gave an interesting comparison of English and German coal qualities. The writer, who has for a long time represented German coal interests in England, states that the high output of gas per ton, which was formerly required, no longer plays such an important part. Coke make now receives greater attention. Best Durham gas sorts, however, with about 32 to 35 p.ct. volatile, still command a high price, as they are much in demand by the big London gas companies for mixing with cheaper and poorer qualities. They are also essential to the antiquated gas plants of some of the smaller Scandinavian towns. It should be noted that the better English gas coals do not exceed an average of 7 to 8 p.ct. ash, whereas the German makes have more like 10 p.ct. German gas coals, however, can compete for export with such brands as Holmside by delivering a half-and-half mixture of unscreened gas and long-flame gas nuts III./IV., which their customers on the Continent appear to find very satisfactory. As regards coking coals, only Durham makes can be considered equal to the German. They are usually sold as unscreened, but, owing to their soft nature, they are generally more like smalls on delivery. They have a volatile of 26 to 30 p.ct. (rarely less than 26 p.ct.), and, being unwashed, vary in ash between 6 and 12 p.ct., averaging, perhaps, 9 or 10 p.ct. Many consumers prefer Durham coking coals, owing to the high moisture content of the German. Others, however, give preference to the latter—especially those who have ovens of German pattern.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Confidence in Gas.

Sir,—The letter in your issue for Jan. 26, over the signature of S. B. Johnson, the Engineer and Manager of the Colombo Gas and Water Company, is one which makes gas engineers sit up and wonder. Certainly many directors of companies, after reading the splendid accounts of results obtained by the staff of the Colombo Company, must feel that unless their companies are doing equally as well, their engineer and manager and staff must be neglecting some of the three fundamentals referred to in Mr. Johnson's letter.

I am writing this letter in the hope that all directors will not feel, as Mr. Johnson apparently does, that the engineer has only to be "up and doing" to get the lighting load—especially private lighting—in face of any competition. The Colombo Gas and Water Company are fortunate in having results such as they now enjoy. While not wishing to belittle any of the accomplishments of their staff—as there will always be two sides to every question—I feel a little further explanation by Mr. Johnson is necessary before he can put forward statements which, after all, must create a little irritation to some hard-working engineers, and make a few boards of directors feel their manager is not doing his best.

Financial Standing of the Company.—I do not know the financial position of the Colombo Gas and Water Company, but they must be in a pretty good condition. They are evidently extending their mains a few miles, and fitting-up many houses with gas for cooking—probably free fittings for lighting also.

Room for Development.—They have evidently got a field to extend into. Every gas company is not in the happy position of having this.

Competition.—The competition he refers to must be almost non-existent to allow him to make headway as he has done, for, after all, an electricity company paying a dividend of 15 p.ct., free of tax, and placing a few thousands of pounds to reserve, are certainly not showing much desire to stop the opposition getting a lot of the business that they themselves ought to be securing. Mr. Johnson's price for gas is not really high. It would be interesting to know what electricity is per unit. We are in competition with an Electric Corporation here. I use the word competition advisedly, as it deserves another name. Our Electric Corporation have never paid a dividend, and are thousands of pounds in arrears, owing to their frantic haste to wipe out this Company, kill competition, and get to a position where they can probably pay a dividend.

Lest it might be thought that the "grapes are sour," let me hasten to say at once that I have experience of gas and gas-works, English, foreign, and tropical, and fierce competition. I came out here some years ago to be told that I would return in a few weeks, as this Company could not possibly exist, and so on; but I am still here, and the little Company, though having fought some stiff fights in the interval, still exists, and is to-day paying a dividend—indeed, our prospects are brighter than ever before in the history of the Company. We are, however, losing private lighting—not through "apathy or indifference," but in spite of my having done everything possible to retain it. We have increased our street lighting a little, but it requires more than Mr. Johnson's three fundamentals to achieve the success he has obtained in the past three years.

Will enthusiasm or a thorough knowledge of gas from A to Z replace mantles, or prevent their being damaged by insects, prevent globes from being broken by the same cause, prevent winds from sweeping through the open houses necessary in the tropics, which cause the lights to flare up and down, and at times put them out entirely?

No, these are definite facts which must be faced and overcome. We have very high winds here, myriads of small insects, and at certain seasons flies and flying beetles. Occasionally a 3-in. or 4-in. moth will hit a globe; and, after all, mantles are fragile things. Insects do get into the globe. I have tried to obtain a burner which could be deemed absolutely insect and draught proof. Naturally one has to remember that with electric bulbs selling for 9d. upwards a burner must not be too expensive, as the average householder consumer in Bardabos is not a wealthy profiteer. If we get this burner and a stronger mantle, then I venture to say that gas lighting for private houses may be able to hold its own. So far, I have been unable to get such a burner.

I certainly think there is no call for Mr. Johnson, in referring to loss of lighting, to accuse the unfortunate engineer of "sheer apathy and/or indifference." By all means give Mr. Johnson and his staff credit for what they have done; but he would be a very bold man to address the Institution meeting, and use the words on the platform that he has done in his letter. I certainly could not let it pass unchallenged.

When the Electric Company in Colombo gets a live manager who desires to show what competition can really be, gas for private lighting in Colombo will go the way of gas for house lighting elsewhere (in the tropics) unless we can obtain a conveniently and easily lighted insect and draught proof burner combined with a stronger mantle. At present, probably the field is large enough for both to work comfortably without fighting, and the Manager might still be a live-wire, though not interfering with gas.

Co-operation of Directors.—It is possible that many Directorates would get really enthusiastic engineers and much better results if they would share their manager's enthusiasm; but the majority of boards of directors appear to adopt a "cheese-paring" policy, to obtain the utmost they can from the manager, and pay him as little as possible. I know scores of cases in England where, after 20 or 30 years' hard work, the outputs, &c., have increased four, five, or six times during the manager's tenure of office. To-day these managers are receiving in salary little more than their stokers. Some companies allow their engineers to do everything possible, bring in all the business, all the profit they can make for the directors and shareholders, and apparently never feel these engineers would like to enjoy a little by way of bonus or increase of salary. You cannot expect the best (enthusiasm) from any man under such conditions. Again it is not a case of "grapes are sour." The treatment I have received from my Directors would bring the best out of anyone. I only refer to this part of the matter in the hope that other directors might try the experiment on their staff.

Vive ut vivas is worth remembering, Mr. Johnson, and because you are in a very favourable position for extension, increases, &c., it is not fair to accuse the profession on the lines you have done.

J. W. Brown.

Barbados Gas Company,
Feb. 23, 1927.

"L & N" Coal Distillation, Ltd.

Sir,—In the prospectus of the above Company which appeared in the "Morning Post" and "Financial News" of March 11, one of the attractions held out was the projected distillation of the Australian Morwell brown coal, which was described as the "richest oleiferous coal in the world," or words to that effect.

In looking through our books, I find that my colleague Mr. C. W. Tozer and myself treated a consignment of this material by low-temperature carbonization in 1911, in our works at Battersea. It occurred to me that the results we obtained might be of interest both to the "L & N" Company and to your readers.

Our view was that it was pretty poor stuff; and we advised our clients to leave it alone.

F. D. Marshall.

19, *Queen Anne's Chambers,*
Westminster, S.W.,
March 26, 1927.

Copy.

Australian Morwell Brown Coal Tested at Battersea,
May 30 and 31, 1911.

This coal arrived at Battersea in four sealed iron tanks. The tanks were opened on May 29, and the contents were thoroughly mixed and sampled until there was about 1 ton left. This ton was reserved for the test.

The coal as sampled on opening the tanks was found to contain 44·30 p.ct. of moisture.

Four charges of the coal were distilled, and the tar, oil, and liquor were measured after the fourth charge was withdrawn.

Total weight of coal distilled as weighed at Battersea, 1578·5 lbs.

Products as weighed at Battersea:

Coke	618 lbs.
Oil	4 gallons
Thick tar	5·25 ,,
Ammonia liquor	286 ,,

Oil contains 48·2 p.ct. of liquor by volume. Net crude oil, 2·07 gallons. This yield is equivalent to 2·94 gallons of liquor-free oil per ton of coal as weighed at Battersea. Specific gravity of oil (liquor free), 0·949.

Refined Products.	P.Ct.	Sp. Gr.
Light oil (naphtha)	0·4	0·862
Middle oil (burning oil)	32·4	0·935
Residual oil (chiefly lubricating oil)	24·3	0·932
Paraffin scale	0·7	
Loss on refining	42·2	
	100 0	

Thick tar—Liquor in tar by volume, 22·9 p.ct. Net thick tar—4·05 gallons. This yield is equivalent to 5·7 gallons of liquor-free tar per ton of coal as weighed at Battersea. Specific gravity of thick tar (liquor free), 1·061.

Refined Products.	P.Ct.	Sp. Gr.
Light oil (naphtha)	1·1	0·801
Middle oil (burning oil)	9·8	0·917
Residual oil (chiefly lubricating oil)	15·5	0·933
	26·4	
Paraffin scale	0·9	0·917
Pitch	53·9	
Loss on refining the oil	18·8	
	100·0	

Ammonia liquor contains ammonia equivalent to 2·831 lbs. of ammonium sulphate per ton of coal as weighed at Battersea. Coke contains 5·88 p.ct. of moisture. Yield of dry coke, 518·7 lbs. This yield is equivalent to 825·5 lbs. (or 7 cwt. 1 qr. 13·5 lbs.) of dry coke per ton of coal as weighed at Battersea. Proximate analysis of dry coke:

	P.Ct.
Ash	5 08
Volatile matter	14·91
Fixed carbon	80·01

C. W. Tozer.
F. D. Marshall.

REGISTER OF PATENTS.

Oil Gas Generator.—No. 255,448.

MISCH, O., of Frankfurt:

No. 17,404; July 12, 1926. Convention date, July 20, 1925.

For the production of permanent gas from oil, and specially from tar, in accordance with this invention, a retort filled with coke, as heat accumulator, is used. This retort is heated from outside to a sufficient temperature for the gasification and decomposition of the tar and oil, and ends with its lower part in a generator, the gas of which is partly used for the heating of the retort and partly as circulating gas to heat the retort both externally and internally.

The patentee remarks that "the moderate price at present paid for crude tar not quite free of water and the difficulty of sale of gas coke, may induce the gas-works to adopt this process with advantage."

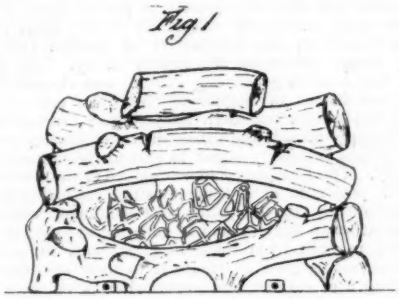
Gas Fires.—No. 266,152.

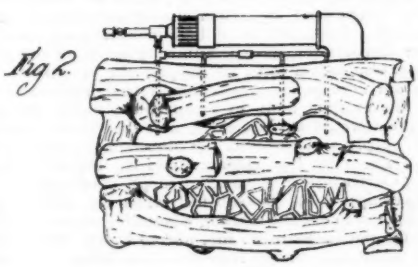
SOUTH METROPOLITAN GAS COMPANY and CHANDLER, D., both of Old Kent Road, S.E. 15.

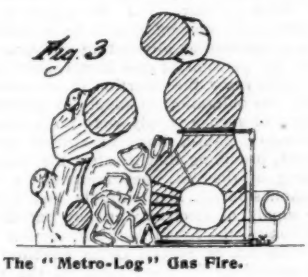
No. 7690; March 19, 1926.

This specification covers the now well-known "Metro-Log" gas fire, and describes it as a gas fire with radiants which are of fireproof material, shaped and preferably also coloured, to resemble logs; means being provided for obtaining luminous flames in addition to the substantially non-luminous flames necessary for proper heating of the radiants.

To the luminous flames which resemble those obtaining in a log fire, unmixed gas is led in pipes through the logs; the gas supply







The "Metro-Log" Gas Fire.

therefor being arranged at the back of the fire. In order to obtain the necessary heating of the radiants, one or more bunsen burners are provided at or near the bottom of the fire. The bunsen burners may form part of one of the logs, or may be separate, in which latter case they are preferably arranged under the logs or otherwise concealed from view. We reproduce a front elevation, a plan, and a cross section of one form of the fire.

Gas Manufacture.—No. 266,108.

HUMPHREYS & GLASGOW, LTD., and STELFOX, J. C., both of Victoria Street, S.W. 1.

No. 1684; Jan. 20, 1926.

In the manufacture of gas by what is known as complete gasification in a single generator, the resulting mixture of coal gas and blue-water gas may be of too low a calorific value for direct use. To enable a richer gas to be obtained without resorting to carburetting or the like, which at times may not be desirable, it has been proposed to remove a portion of the coke, at the bottom either of the gasification chamber or of the carbonization chamber. In the latter case provision has merely been made for withdrawing the coke from one side of the chamber, with the result, since the outside portion of the fuel column becomes more quickly carbonized than the core (unless the rate of production is very much reduced), that some coal which is only partly carbonized is extracted, and the outer marginal portion of the column of fuel tends to become unevenly carbonized.

To avoid the disadvantages referred to, according to the present invention, coke is removed from the outer marginal portion only of the column of fuel at or near to the bottom of the carbonization chamber, evenly or substantially so from around the whole perimeter of the column.

By regulating the speed of extraction it can be made to compensate for the usual greater rate of carbonization at the outer part of the column, thus tending to ensure that the fuel which descends into the gasification chamber shall be more evenly carbonized throughout its cross section.

The specification describes the generator in detail with drawings; and the claims show the coke extractor to comprise "a rotary ring having a series of doors hinged thereto so as to tend to open inwards when the ring is rotated in one direction, and to project into and displace outwardly the marginal portion of the fuel." An alternative arrangement is "a rotary plate having fins so inclined that when the plate is rotated in one direction they will displace outwardly fuel from the marginal portion of the fuel column and a reversely inclined fin adapted to cause discharge of the displaced fuel."

Gas Cooking Apparatus.—No. 266,233.

RADIATION LIMITED, and YATES, H. J., both of Grosvenor Place, S.W. 1.

No. 22,372; Sept. 10, 1926.

This invention relates to gas-heated cooking apparatus of the kind in which the hotplate includes a grill in combination with one or more boiling burners. With the hotplate arrangements ordinarily employed for domestic and like purposes, it is found that the heated products of combustion issuing from the grill burner may pass into the combustion zone of a boiling burner, and interfere with proper combustion. The object of the present invention is to prevent this; and the arrangement, say the patentees, is especially useful where the overall size of the hotplate is restricted, necessitating a somewhat close arrangement of burners.

The invention comprises the employment, along one side or edge of the grill fret, of a deflector extending above and below the fret and adapted to deflect the products of the grill burner away from the adjacent boiling burner.

Furnaces.—No. 266,487.

RADIATION LTD., of Birmingham, BRAYSHAW, S. N. & E. R., both of Hulme.

No. 31,399; Dec. 12, 1925.

This invention relates to gas-fired furnaces in which inlet pipes for gas or air are placed in discharge or regenerative chambers within the wall of the furnace.

According to the invention, the inlet pipe in the discharge chamber, whether for gas or air, is surrounded at the vulnerable point near the bottom where the hot products first strike it, with a short, loose, inexpensive, and renewable metal protecting tube; and in combination therewith a detachable mixer and deflector for the gas and air is placed in the flue beneath the furnace floor to deflect the flame on to the underside of the floor at any desired point.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 23.]

Nos. 6999-7685.

ASHMORE, BENSON, PEASE, & CO., LTD.—"Reversing valve for gas purifiers." No. 7676.
CANNING, T. F.—"Manufacture of coal gas." No. 7216.
CLARK, F. W.—"Manufacture of gas." No. 7032.
CLARK, R. G.—See Canning, T. F. No. 7216.
FENNIMORE, G. A.—"Igniting device for gas stoves." No. 7611.
JOHN, W. E.—"Extracting oil from coke." No. 7600.
LYNE, R. J.—"Apparatus for gas manufacture." No. 7227.
LYNE, R. J.—"Gas pressure regulator valve." No. 7228.
MCROBBIE, W.—"Prepayment gas meters." No. 7617.
MENELL, G.—"Retort for distillation of bituminous solid fuels." No. 7487.
MILNE & SON, LTD., J.—See McRobbie, W. No. 7617.
RUTHERFORD, T. A.—See Ashmore, Benson, Pease, & Co., Ltd. No. 7676.
SALERNI, E. M.—"Heat treatment of carbonaceous, &c., materials." 7205.
SALERNI, E. M.—"Heating or cooling liquids, gases, &c." No. 7209.
SALERNI, E. M.—"Gas-scrubbers, &c." No. 7245.
SALERNI, P. M.—"Distillation of carbonaceous materials." Nos. 7353, 7370.
SALERNI, P. M.—"Manufacture of briquettes." No. 7455.
STEWART, C.—"Gas stoves." No. 7220.
SUMNER, L. G.—"Geysers." No. 7027.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Commercial Gas Bill: Reported, with amendments.

Reading Gas Bill: Brought from the Commons; read the first time, and referred to the Examiners.

South Staffordshire Mond Gas Bill: Reported that opposition had been withdrawn. The Order previously made discharged, and the Bill committed.

Southgate and District Gas Order: Referred to the Special Orders Committee.

HOUSE OF COMMONS.

Progress of Bills.

Southgate and District Gas Order: Copy presented.

Stoke-on-Trent (Gas) Bill: Reported, with amendments.

Low-Temperature Carbonization.

Colonel Lane Fox, on March 22, gave a negative answer to Mr. Potts, who desired to know if any colliery company had plant for low-temperature carbonization, and the quantity of coal so treated, and the result.

COMMERCIAL GAS COMPANY'S BILL.

Basic Price and Dividend—Employee Directors.

The Commercial Gas Company's Bill, the main proposals of which are to substitute the basic price and dividend system for the standard price and sliding-scale, and to empower the election of employee Directors, was considered by the Unopposed Committee of the House of Lords (presided over by the Earl of Donoughmore, Lord Chairman of Committees) on Tuesday, March 22. The Committee ordered that it should await report.

To the clause enabling the Company to cut-off the supply of gas in cases where consumers have failed to comply with the Company's request to repair piping or appliances in a dangerous condition, there has been added the proviso, which is now usual, exempting railway companies' property (other than dwelling houses).

DUNDEE PROVISIONAL ORDER.

The Dundee Corporation give notice of their intention to apply, under the Private Legislation Procedure (Scotland) Act, for a Provisional Order for various purposes. One of these is to enable them to manufacture, sell, provide, supply, and deal in any products in which coke, tar, pitch, asphaltum, ammoniacal oil, and any other products or residuum of any materials employed in or relating to the manufacture of gas may be used alone or in combination with any other materials. Another clause is:

> To empower the Corporation, in the event of any occupier of any buildings erected prior to the Dundee Corporation Order, 1907, within the limits of the gas supply of the Corporation complaining of a deficient supply of gas, to investigate and enter buildings with or without the consent of the owners for the purpose of renewing or enlarging the gas pipes from the gas main to the meter, without obligation by the Corporation to do so, unless the owner indicates his willingness and undertakes to enlarge or renew that portion of the private piping conveying the gas from the meter to the burner, and to empower the Corporation in the event of the owner refusing or failing to indicate his willingness and undertaking to renew or enlarge the private piping to enter upon the buildings with or without the owners' consent for the purpose of renewing or enlarging the piping from the main to the meter and charge the owner with the full cost thereof, and to recover the same from him.

BOGNOR GAS AND ELECTRICITY BILL.

(*Before* Earl Russell (*Chairman*), *Earl* Lovelace, Earl of Westmorland, *Viscount* Chaplin, *and Lord* Erskine.)

The main proposals of the Bill are to enable the Bognor Gas Light and Coke Company to change their name to that of "The Bognor Gas and Electricity Company;" to enable them to raise further capital; and to extend the limits for the supply of both gas and electricity. There are also a number of more or less usual clauses relating to gas and electricity supply (see "Journal" for Jan. 12, p. 83).

The only petitioners remaining when the Bill reached the Committee were the Westhampnett Rural District Council, whose opposition was directed, in the main, to the extension of the area for the supply of electricity. Their point was that certain parishes in the rural district had been within the area of supply for electricity since 1912; but the Company had not supplied electricity to any of them. Therefore the Company's area should not be extended to include further parishes. The Council suggested that the Company should be put under an obligation to lay mains within two years from the passing of the present Bill in the parishes at present in the area of supply. There was also objection to the charging of a differential price for gas in a parish within the rural district. The Company replied that it was not practicable to supply electricity in the rural district, because the demand was not such as to make it commercially justifiable, and also because it was physically impracticable owing to the distance, inasmuch as the Company were supplying electricity on the direct current system. Arrangements were to be made, however, for a bulk supply of alternating current to the Company; and they would then be ready to supply within the rural district where the demand justified it.

The Company were represented by Mr. Rowand Harker, K.C., and Mr. Ralph Bury; and the Rural District Council, by Mr. F. G. Thomas, K.C.

Mr. Rowand Harker said there were no objections to the proposals to change the Company's name and to raise further capital. The authorized capital was £704,000, of which there remained unissued £25,926. The loan capital authorized and issued was £39,250. The Bill proposed to empower the Company to raise £100,000 of new capital; and to borrow up to half the capital already authorized and unexercised, and half that authorized by the Bill, making total borrowing powers under the Bill of £62,963. Adding the £25,926 capital powers already authorized but unexercised, the total capital and borrowing powers of the Company when the Bill was passed would be £188,889.* The additional capital now asked for would be sufficient to enable the Company to carry on for another ten years.

Originally there were a number of petitions against the Bill. The Bognor Urban District Council had opposed with regard to the raising of the new capital. The question of the capital raised, of course, affected the consumer; and the Council were principally concerned with that aspect of the matter. But they were no longer opposing. The Arundel Corporation, in whose borough it was proposed to supply electricity, had petitioned, but were not appearing. An agreement had been come to between the Company and the Corporation. This had not yet been included in the Bill, because the drafting had been delayed; but the Corporation reserved their rights with regard to future action. The Littlehampton Gas Company, part of whose area it was now proposed should be supplied with gas by the Bognor Company, had also petitioned; but agreement had been reached in that case. There remained, therefore, the opposition of the Westhampnett Rural District Council; and on that there would emerge the issue as to whether the Company should be placed under an obligation to supply electricity in certain places, no matter what the cost would be to the Company, and irrespective of whether that supply would give any proper return on the capital outlay. The Company, said Counsel, had a small generating station, and electricity was supplied in the urban district of Bognor on the direct current system. The fact that this system had been adopted had limited the Company's ability to supply outside the urban district. Owing to the increasing demand, it was necessary either to extend the station or to obtain a bulk supply. The Company had not applied to the Electricity Commissioners for power to extend the existing station, inasmuch as this would be contrary to the policy of Parliament, which was to stop generation at small stations and to generate at large stations—supplying current in bulk from these large stations to authorized distributors, who would then distribute it to their consumers. Therefore the Company had entered into negotiations with the Chichester Corporation for a bulk supply, through them, from the Portsmouth Corporation. The Chichester Corporation already obtained a bulk supply from Portsmouth. Inasmuch as a high-tension main belonging to the Chichester Corporation passed within 1¾ miles of the boundary of the Bognor Company's area of supply, the proposal was that Chichester should take an extra bulk supply from Portsmouth, transmit it along this existing main to a convenient point, where a new high-tension main would be connected, and the current conveyed to Bognor. The supply was to be on the alternating current system at 11,000 volts. The new high-tension main to Bognor would pass through various townships in the area of supply outside Bognor itself; and these townships would be supplied when the demand justified it. It was proposed to use the existing generating plant of the Bognor Company for the remainder of its life, and to supply direct current in Bognor; the additional current required there being converted from alternating to direct current. For the supply in the areas outside Bognor, the alternating current would be transformed to 230 volts, and supplied to consumers as alternating current.

Dealing with the petition of the Rural District Council, he said the Company would resist the insertion of any clause in the Bill putting them under the obligation to supply in parishes in the rural district if the giving of such a supply were not commercially justifiable. They had inserted a clause, however, which they asked the Committee to approve, providing that if, after the expiration of five years from the passing of the Act, they had not, in the opinion of the Electricity Commissioners, laid suitable and sufficient distributing mains for the supply of electricity in any parish added by this Bill to the existing limits, the Local Authority or any company or person could apply for an Act or Special Order enabling them to give such a supply, and providing for the repeal of the Company's powers. This did not apply to the parishes already within the Company's limits of supply. Since 1888, the District Council had had power to apply for an Order enabling them to supply in the whole of their area; but they had not exercised it. The Council also raised objection to other clauses, including the one giving the Company power to extend their limits for the supply of gas to include the parish of Middleton, which was in the rural district, and to charge within that parish 0·6d. per therm more than the price in Bognor or in the parishes of Felpham and Bersted, which two parishes were also within the rural district.

Commenting on a report by the Minister of Transport, in which the question of compelling the Company to supply electricity within definite periods of time in various parts of their limits of supply, was raised, Counsel said that an agreed clause was inserted in the Bill compelling the Company within two years to lay distributing mains reasonably suitable and sufficient for the purposes of a general supply of electricity in certain streets in Arundel. The report also pointed out that an application had been made to the Electricity Commis-

* It was stated in the "Journal" for Jan. 12 that the additional capital powers sought were £150,000, but that figure was inserted in the Bill in error. The Bill was subsequently amended, and the figure reduced to £100,000.

sioners by the Electric Supply Corporation, Ltd., for a Special Order authorizing the supply of electricity in an extensive area embracing the borough of Arundel and some of the parishes it was now sought to add to the area of supply of the Bognor Company. Counsel informed the Committee, however, that the body in question had not opposed the present Bill; and he suspected their absence might be due to the fact that there was in the Special Order applied for by them a fatal defect. A clause was inserted in the Bill providing that if, after five years from the passing of the Act, the Company had not laid mains for the supply of gas in Middleton and Climping, the Local Authority or any company or person could apply for an Act or Special Order for the purpose of giving such a supply, and repealing the Company's powers.

Mr. *T. N. Ritson* (Vice-Chairman of the Bognor Company, and Engineer and General Manager of the City of Chichester Gas Company) gave evidence in support of the Bill. The Littlehampton Gas Company, he said, did not wish to give a supply of gas in the greater part of the parish of Climping, partly owing to the difficulty of laying mains sufficiently large across the River Arun. They wished, however, to supply in part of the parish; and the Bognor Company did not object to that. The existing capacity of the Bognor Company's gas plant, with the exception of holders, was 500,000 c.ft. per day, which was about equal to the maximum demand; so that there was little or no stand-by plant. The retorts were working at full capacity. The quantity of gas supplied by the Company had increased from 64 million c.ft. in 1916 to 124 millions in 1926. The whole district was developing very rapidly. The agreement with Chichester for the bulk supply of electricity would not be completed before the Committee parted with the Bill; but there was no doubt that the Company would get the supply. In cross-examination, witness said the Company would probably be prepared to supply electricity in the parish of Felpham and in Aldwick, when they obtained the bulk supply.

Mr. *G. V. Twiss* (Consulting Engineer) gave evidence in support of the electricity proposals.

Mr. *William Cash* (Auditor to the Bognor Company) submitted a number of tables dealing with capital received and expended, the income and expenditure accounts, and dividends, which showed, he said, that the undertaking was a well-managed one. It was, he said, estimated that within the next ten years £60,000 would be needed for gas purposes.

Wednesday, March 23.

Cross-examination by Mr. THOMAS was directed to the question of the differential charge suggested for Middleton. Counsel pointed out that Middleton was a stage on the way to Climping, and that there was a main already in existence within a quarter-of-a-mile of Middleton, so that the differential of 0·6d. per therm was not justified.

Mr. *Cash* replied that obviously a bigger main would have to be laid in order to give a supply to Middleton. He attached importance to the fact that the inner area desired to know that they were not going to be charged a higher price for gas owing to the fact that the Company were supplying Middleton. Though there was a main within a quarter-of-a-mile of the Middleton boundary, it would be necessary to go a considerable distance over the boundary before one came to an aggregation of houses.

No evidence was called on behalf of the Rural District Council.

Mr. THOMAS, in his address to the Committee, pointed out that the Rural District Council were not hostile to the Bognor Company. Their object was simply to provide for a supply of electricity in the area. Everything depended upon the conclusion of the agreement with Chichester for a bulk supply. There were parishes within the rural district which it was now proposed to include within the Bognor Company's limits of supply for electricity, but which were nearer to Chichester than to Bognor, and might be able to obtain a supply from Chichester more quickly than from Bognor. He asked, therefore, that those parishes—namely, Tangmere, Boxgrove, Eartham, and Upwaltham—be not included in the Bognor Company's area of supply.

Mr. ROWAND HARKER said he would leave the Committee to decide whether or not those parishes should be included. He also indicated that the Company were prepared to accept clauses making it compulsory for them to have a supply of electricity available in Aldwick and Felpham within two years.

The Committee's decision was that the preamble of the Bill was proved. With regard to electricity, they decided that the parishes of Tangmere, Boxgrove, Eartham, and Upwalton should not be included within the Company's limits of supply; and that the Company should be compelled to lay distributing mains in certain streets in Aldwick and Felpham within two years, and in certain streets in Yapton within three years.

STOKE-ON-TRENT CORPORATION (GAS) BILL.

This Bill was approved by the Unopposed Bills Committee of the House of Commons, presided over by Captain E. A. FITZROY (Deputy Chairman of Ways and Means), on Wednesday, March 23. The main purpose of the Bill is to empower the Corporation to lay a main along a route in the urban district of Woolstanton United, in order to connect-up their gas-works at Longport and Etruria. (See "JOURNAL" for Jan. 26, p. 190.)

Mr. R. H. FOX (Messrs. Torr, Durnford, & Co., Parliamentary Agents) explained the activities of the Corporation in connection with the amalgamation of their various gas-works, and the concentration of gas manufacture at the Etruria Works, and said that clauses had been agreed upon, and inserted in the Bill, for the protection of owners of property likely to be affected by the provisions of the Bill. There were also one or two clauses dealing with administrative matters; and he referred to one giving the Corporation power to require consumers to repair apparatus in a dangerous condition, or otherwise to cut-off the supply of gas. It would also empower the Corporation to recover expenses "reasonably incurrred." In precedents for this clause, the promoters of Bills had been empowered to recover expenses "lawfully" incurred. The Stoke Corporation had agreed with the London, Midland, and Scottish Railway Company an amendment providing that the clause should not apply to the property of the Railway Company other than dwelling houses.

The clause for the protection of the Wolstanton United Urban District Council provides that the works authorized, in any road vested in the Council, are to be laid in such a position as the Council may reasonably direct, and at such a depth as will not interfere with the maintenance of access to the existing gas pipes of the Council. If it is found to be more convenient to alter the position of any pipe of the Council, and that such alteration can be effected without permanently interfering with any of the services now being afforded by the Council, the Corporation may, if they desire, carry out such alterations to the reasonable satisfaction of the Council's Surveyor. The notice required by section 8 of the Gas-Works (Clauses) Act, 1847, with respect to the breaking-up of streets, is to be seven days, instead of three. The Corporation are to pay the Council the salary of a Clerk of the Works to be employed by the Council to watch the construction of the authorized works in the district. If damage is caused to any property of the Council as the result of the Corporation's operations, it is to be made good by the Corporation, or by the Council, if they so elect, at the expense of the Corporation. Differences are to be referred to two Justices sitting as a Court of Summary Jurisdiction.

For the protection of the Staffordshire Potteries Water Board, it is provided that the authorized works are to be constructed so as not to prevent ready and full access to the existing pipes and works of the Board. Disputes are to be determined by an arbitrator to be appointed, failing agreement, by the President of the Institution of Civil Engineers. In a clause for the protection of the Potteries Electric Traction Company, Ltd., it is provided that fourteen days' notice is to be given by the Corporation to the Company, and full particulars and plans deposited, when the Corporation desire to sink a trench, or make or repair any works across, under, or within 3 ft. of any light railway or tramway of the Company, or of any posts or cables used by them, except in case of sudden emergency. The Traction Company are to be entitled to superintend the work, and the Corporation are to conform to the reasonable requirements of the Company for protecting their property from injury or subsidence. Any reasonably necessary interference with, or alteration of, the property of the Company may be carried out by the Company, if they give notice within seven days of the receipt of the particulars and plans, under the supervision (if given), and in accordance with the reasonable directions of, the Corporation; and the reasonable expense incurred is to be repaid to the Company by the Corporation. If injury is done by the Corporation to the property of the Company, the property is to be restored to as good a condition as it was in previously, at the expense of the Corporation. The Corporation are to recoup to the Company all costs and expenses. If during, or within six months of the completion of, any works of the Corporation, any subsidence of any tramway of the Company results, the Corporation are to pay compensation for the losses incurred by the Company. Disputes are to be determined by an arbitrator to be appointed, failing agreement, by the President of the Institution of Electrical Engineers.

The clause for the protection of the London, Midland, and Scottish Railway Company provides that the Corporation shall not acquire by compulsion any lands or property of the Company; but the Company shall sell to the Corporation, if required, such easements or rights as are necessary. Sections and specifications are to be submitted to the Company for approval before the Corporation construct or repair authorized works, such approval not to be unreasonably withheld. The Company shall be deemed to have given approval if they do not signify disapproval within twenty-one days. When, in the opinion of the Engineer of the Company, there is not reasonably sufficient space on any bridge to lay the authorized works between the road surface and the structure, the Company may require them to be carried below or outside the structure, and shall afford all reasonable facilities for the purpose. The work is to be done to the reasonable satisfaction of the Engineer of the Company. The Corporation are to give fourteen days' notice before carrying out any of the authorized work, except in cases of emergency, when such notice as is reasonably practicable shall be given. The Corporation are to pay the Company all reasonable expenses incurred in connection with the employment of inspectors, signalmen, watchmen, and others, and for superintendence and extra precautions (if any) for the safety and working of their traffic or for the protection of their property during construction or repair of authorized works. If any damage to the Company's property or interference with traffic is caused, the Corporation are to restore the damage and remove the interference; or the Company may do so and demand payment from the Corporation. The Corporation are to make reasonable compensation for loss or damage due to failure of the authorized works. Disputes are to be determined by an engineer to be agreed upon, or appointed by the President of the Institution of Civil Engineers.

Co-Partnership at Chester.—The annual co-partnership meeting of the Chester United Gas Company was presided over by Sir John M. Frost (the Chairman of the Company), who said that in the past year £1438 had been allocated to the co-partnership fund, which enabled the bonus to be retained at 6½ p.ct. Out of 138 members of the scheme, there were 95 who were holders of the Company's stock; and with the addition of the bonus now declared others would be able to invest in at least £10 of stock. That constant and efficient supply of gas was maintained during the coal stoppage testified to the value of the co-partnership scheme and the principle upon which it rested. He made sympathetic reference to the late Mr. F. A. Pye, who was Secretary of the scheme from its inception up to the time of his death, and had had much to do with its inauguration.

LEGAL INTELLIGENCE.

A GAS BILL GUARANTEE.

An Appeal from Ipswich.

In a King's Bench Divisional Court (consisting of Mr. Justice Acton and Mr. Justice Talbot), on March 22, a question of considerable interest was raised on the appeal of Mr. Herbert Thomas Arnold against a decision of the Ipswich County Court Judge in favour of the Ipswich Gas Light Company. The Judge found (as reported in the "Journal" for Oct. 27 last, p. 240) that Mr. Arnold was due to pay the Company £13 15s. as the guarantor on a form of application by a Mr. W. T. James for a supply of gas to his house. It was pointed out that the Judge held that the word "guarantor" was on the application form when Mr. Arnold signed it; and he knew he was undertaking some sort of liability, even if he was not sure of the extent of it.

Mr. Woodfin, for the appellant, said Mr. James wanted a supply of gas, and the Company asked for 30s. deposit, which Mr. James refused to pay. He saw the Secretary, said he was not disposed to pay the deposit, and told him he could refer to Mr. Arnold. The form of application was forwarded to Mr. Arnold, with the intimation that he was given as a reference; and the word "guarantor" was on the document. Mr. Arnold now said the word was not there when he signed the document. The words, said Counsel, were "payment of account guaranteed by Mr. W. T. Arnold." The appellant urged that the Judge was wrong in saying that he was a guarantor, or, at any rate, guarantor for more than 30s.

Mr. J. W. Morris, for the respondents, said that Mr. Arnold, when he replied to the application for the money under the guarantee, wrote that he did not know he was a guarantor for ever. He said he guaranteed the first quarter's bill in 1923, but not one unpaid years later.

Mr. Justice Talbot: Upon your construction of the words he must be liable for a six years' bill?

Mr. Morris: Yes, though normally a company would not allow a bill to accumulate for six years. As a matter of fact, Mr. Arnold guaranteed the gas bills of Mr. James as they became due, according to the document he signed. The document meant that, if Mr. James could not pay, Mr. Arnold would be called upon to do so.

Mr. Justice Talbot: If Mr. Arnold had lent Mr. James 30s. at the time of the application, he would not have landed himself into this difficulty and a claim for £13, with all the possible costs of this litigation.

Mr. Morris replied that Mr. Arnold could have ended the guarantee at any time, so he had not entered into an impossible contract. The law was that a guarantee was a continuing one unless the guarantor limited it to a particular time or ended it. Therefore Mr. Arnold could not say that his guarantee was for one sum or for a specific time.

Mr. Justice Acton said that the point that the appellant was only guaranteeing the deposit of 30s. had no substance in it. In fact, on all the questions the Judge at the County Court was right in his decision. What was the meaning of the somewhat slipshod guarantee document? It had been contended that it was a continuing guarantee that Mr. Arnold would pay Mr. James's gas bills if the latter did not pay them. Irregular and slipshod as the document was, this construction seemed to be none other than that contended for by the Company. In the circumstances, the appeal failed, with costs.

SUCCESSFUL ASSESSMENT APPEAL.

A Large Refund.

The Assessment Committee of the Tynemouth Union, at a meeting at the Guardians' Hall, North Shields, on Wednesday, March 23, further heard the objections by the Tynemouth Gas Company. The case had been before the Committee on two previous occasions, the Company having in the middle of February served notices of objection against their assessments.

The Tynemouth Gas Company decided, in view of the new Rating and Valuation Act, 1925, which comes into force on April 1, to take advice on their existing assessments, with a view of appealing so soon as the new Committee came into force; but, acting on advice, they served the notices of objection against the current rate. The total assessments objected to amounted to £8027 5s. net rateable value; and at the hearing of the objections the Company were represented by Mr. E. Howard Collins, of 45, Parliament Street, Westminster, a specialist on gas-works assessments. Mr. Collins pointed out that this assessment had stood since 1904, but that since that time a radical change had taken place in the industry, inasmuch as the gas industry had been compelled to embark upon an auxiliary business in order to induce custom. The business referred to was the hiring out of chattels, which formed an important part in the receipts of this particular Company; and statistics were quoted for twenty years past, showing that, in fact, the Company were not rated on their hereditament, but upon the result of the hiring business, which was a large one.

The Committee decided to reduce the assessment to £5625 net rateable value; and the Tynemouth Gas Company have decided to accept this assessment for the current rate, and serve fresh notices of objection as soon as the new Assessment Committee under the 1925 Act come into office. The result to the Gas Company will mean that they are entitled to a refund of over £2000 in respect of the payment of the rates for the period ending March 31.

MISCELLANEOUS NEWS.

EUROPEAN GAS COMPANY, LTD.

ORDINARY GENERAL MEETING.

The Ordinary General Meeting of the Company was held on Tuesday, March 22, at the Offices, Montague House, Devonshire Square, London, E.C.—Dr. Charles Carpenter, C.B.E., M.Inst.C.E. (the Chairman), presiding.

The General Manager and Secretary (Mr. F. Eliot Williams) read the notice convening the meeting, the accounts for the year ended Dec. 31 last, and the Auditors' certificate.

The Chairman: Ladies and Gentlemen,—I had hoped to preface my observations to-day by an expression of pleasure at moving the adoption of the report and accounts. Circumstances, however, have told too heavily against us; and I must include a reference to these with my story of the Company's operations during the past twelve months. Now the unfortunate thing about the working results of the past year is that these have been brought about by causes at home, and not causes abroad. It is true that we have experienced troubles with exchange and franc values. But we should have got through them, and have paid a reasonable dividend on our shares, had it not been for the national coal strike.

Results of the Coal Strike.

Speaking generally, our coal contracts have run from spring to spring; and we had as usual covered our 1926 requirements—purchasing about 80 p.ct. British and 20 p.ct. French coal. When the former supplies ceased, owing to the strike, we were able to contract for other European gas coals at favourable prices. But as the strike continued, great difficulty arose in getting our quantities; and owing to the phenomenal demand arising from the prolongation of the dispute into the winter, we had to make further purchases at enhanced prices. To make matters worse, there was no corresponding increase in the demand, and therefore in the price obtainable, for coke. So we had to bear the brunt of high coal costs without any sufficient compensating return from coke sales, as is generally the case; for I need not remind you that it is the net cost of coal—that is to say, coal less residuals—which counts in our balance-sheet. The extra cost of coal from this cause we estimate to have been between £35,000 to £40,000, equivalent to a dividend upon our capital of 3½ to 4 p.ct. for the year.

You might ask: "What are our reserve funds for meeting such difficulties?" Unfortunately, we have none apart from our general revenue fund. In pre-war days the undertaking was too prosperous for this question to be a matter of anxiety; and since then our course has been so full of difficulties that we have had from time to time to draw upon this general fund, until at one moment it was completely exhausted. We have made additions to it when opportunity offered; but we have not been able to make any sufficient provision of this kind, and the fund now stands at only about £10,000. I hope in the future this will not be the case, and that we may be able to set aside a fund to meet similar emergencies to those which we have been passing through.

Then you may ask: "What about raising the charges for gas?" and at the risk of repetition, I propose once more to deal with this important matter.

The Basis of Charge for Gas.

Before the war, a definite maximum price of gas was associated and co-terminous with each of our concessions; and this machinery was sufficiently elastic to accommodate itself to whatever fluctuations arose from time to time in the ordinary course of our business operations. But in France—as, indeed, in England—all that went to the winds, under the stress of post-war conditions. Entirely new terms had therefore to be negotiated in regard to every one of our concessions; and as neither raw material nor labour costs were stable, a formula was agreed upon in each case, after more or less prolonged discussions, which would take into account these increased costs, using pre-war figures as the basis of computation. I have had placed upon the wall a diagram showing one of these formulæ, from which you will see how costs come into the equations which are used in fixing from time to time the price chargeable to the consumers for gas. The costs of labour and coal and values of by-products come in. These form the factors which give the relationship between the pre-war price and the price to-day; and the result is set out in an equation by which we arrive at the charge to be made. With regard to the formula generally, I think we have no cause to complain; but there are certain complications in connection with it with which I will deal directly.

Now, our largest and most important concession is that of the city of Nantes; and the formula in use there has a serious defect, one we tried hard to get rectified at the time of our bargaining—namely, that it is very sluggish in coming into action. In this particular case, the price chargeable for gas in the second half of a year (from July 1) depends upon costs incurred over the last three months of

the preceding year—that is, from the end of September to the end of December—and the first three months of the year in question. This gives six months' figures to work upon. The next three months are occupied in sorting out this information and agreeing with the municipalities upon the various points; and then the changed figure comes into operation on July 1. So the price which the consumer will have to pay under this formula from July 1 next is based on costs of labour and coal and values of bye-products over six months the end of which is three months removed from the beginning of the new period. You will ask how we came to accept such a state of things. We did our best to get a more compact period; but we were unfortunate, and had to accept this as the best bargain we could make. In normal circumstances it is quite a suitable, easy-running piece of machinery; but it was not at all the sort of thing to adjust itself to the very varying conditions we have been experiencing. During the first half of 1926 we felt little or none of the effects of the strike; and although these became increasingly serious as the second half of the year went on, we were unable to make any increase in our gas charges whatever until the present year—some time, in fact, after the strike was over. I have said we did our best to have this unsatisfactory arrangement modified at the time; but we were unsuccessful. We raised the matter again last autumn, when we saw how it was likely to affect us, because on the face of it there would seem no reason why a set of conditions, if they were in themselves fair, might not equally come into operation at one period as at another. But we were unable to obtain sympathy for our proposals, except at a cost which would have been prohibitive. During this present year we have had higher returns from gas coming in; but they cannot, of course, affect in any way our figures for 1926. In other words, we naturally could not take credit for an accretion that was not due to be received until after the accounts had been closed on December 31.

In the case of our other concessions, the machinery for adjustment moves more quickly, and has given us, therefore, much less cause for anxiety. I ought, however, to make an exception in the case of Amiens. This town is supplied by two gas undertakings, ourselves and a French Company, each having its own area. For the greater part of last year the charge for gas was fixed at a figure so low that we actually worked at a loss. The trouble arose from the interpretation to be placed upon the wording of the revised concession; but I am hopeful that before long the spirit of fairness which has so generally characterized our neighbours' dealings in all these matters will lead to a satisfactory settlement of the dispute.

Question of Exchange.

Overshadowing, however, all these difficulties is the question of exchange. Our anxiety as to this no longer includes that pertaining to the fluctuations produced thereby in the valuation of our floating assets in France. You will remember that upon the last occasion upon which I addressed you, I explained the plan that had been devised to obviate them. I am glad to be able to say that on the whole it has functioned well since it was introduced; and I believe it will operate with even greater precision during the present year, when our revised accounting system will enable us to make closer estimates. But the effect upon our profits of the conversion to sterling of our franc receipts has been very serious. The average rate at which exchange was effected in 1926 was 153 to the pound sterling, as compared with 108 francs in 1925; and therefore the francs we have earned in France represent in that proportion fewer pounds sterling of profit available for distribution over here. I am afraid in these things one's memory is apt to be short; and therefore it may be desirable to remind you of what has taken place in the last year. I have had set out on the wall the monthly average values of the franc during 1926. That for July was 9s. 11d. per 100 francs. By December, as the result of stabilizing efforts, it had risen to 16s. 1d. You will notice that in the low period of July the average was not the lowest point touched; for the value went down to a minimum of 8s. 5d. I need not emphasize the important effect that this has in the transfer of franc profits over here to pay obligations in sterling. What the future has in store, it is impossible to predict. Various newspapers and financial organs have dealt with this question from time to time; and their opinions give little cause for any other attitude than one of anxiety.

Before I take leave of the subject of exchange, I should like to read to you a statement which expresses the situation with something like official authority. In his report to the Department of Overseas Trade on "The Economic and Industrial Conditions in France, 1925-1926," Mr. J. R. Cahill, Commercial Counsellor attached to the Paris Embassy, writes as follows:

> In its varied manifestations and comprehensive reactions the problem of the external value of the franc still dominates French life, political, economic, and social. Every class of the population has come to be materially affected by the movements of the exchanges; and no news is more closely followed daily by the public. It needs scarcely to be recalled that their practical interest is due to the fact that the majority of French imports of first importance, such as wheat, fresh, salted, and frozen meat, sugar, rice, coffee, tea, wines (France imports more wine than she exports), oranges, bananas, cotton, wool, silk, jute, flax, rubber, many skins and furs, mineral and other oils, oil seeds, coal, copper, mica, machinery, machine tools, all come from countries with exchanges appreciated in relation to the franc, and that, on the other hand, the degree of receptivity for French exports in foreign countries is materially influenced by the rate of the franc. The political and general moral interest is not inferior, as the franc movements are the index to the soundness of the governance of the State finances and of the monetary system upon which depends the whole fabric of prices, with their endless reactions on production and consumption.
>
> There is no doubt that, while a certain degree of stabilization has been given to the exchange value (this has now been for some months in the neighbourhood of 125 francs to the pound), the cost of living in France does not seem to have shown any corresponding decrease; and in certain cases actually a slight rise has been recorded. The result has been that a definite slackening of trade has occurred; and this has in turn resulted in a decreased use of gas for industrial purposes, and a voluntary cutting down of consumption by the individual consumer. This was particularly noticeable in the latter part of 1926, and is reflected in the figures of gas sold, which are slightly lower than in the corresponding period—by rather less than ½ p.ct. The number of consumers has, however, increased; and a considerable number of gas-consuming appliances has been placed on hire or sold. It is reasonable to anticipate, therefore, that, even if these new consumers and new appliances do not produce an increase in the sale of gas, they will at least make-up for the loss of consumption due to trade depression and the exercise of economy by our old customers.

Tax on Gas Consumption.

I ought to mention, on the other hand, a special point affecting the gas industry in France, which is not likely to aid the consumption of gas, and over which the Board, again, unfortunately have no control. This is the authority given by the French Government for municipalities to meet part of their budget requirements by, *inter alia*, a tax on the consumption of gas. This tax is payable by the consumers, and in so far does not constitute an additional burden on the supplier. But the mere fact of increasing the already high prices is sufficient to retard further development of our business, and will make it more difficult for our commercial service in their efforts to extend the sales of gas. Furthermore, there is the heavy drain on the Company's liquid reserves by the withdrawal of very large sums in recent years in respect of English and French taxation. These sums would, in the normal course, have gone to strengthen the business, and the effect of spending considerable sums on the replacement of the mains, for instance, would not have been so noticeable. That is to say, whereas it has only been possible to carry out this very necessary work by depleting the profits available for distribution, it should have been possible to carry out the work and yet pay a more satisfactory return on capital invested. Unfortunately, there does not appear to be any prospect of relief on this score, either in France or in England.

Sale of the Company's Fleet.

The report refers to the sale of the Company's fleet. These four colliers were purchased to meet the special conditions resulting from the shortage of shipping during and following the war; and there can be no doubt that they did enable the Company to keep its stations supplied with coal, which might otherwise have been an impossibility. Shipping conditions have now, however, materially altered; and as there appeared little reason to expect such an improvement in freights as would have made it cheaper to run our own vessels, we decided to dispose of them, and in future to charter our carrying requirements in the open market. The result of this transaction is indicated in the balance-sheet. On the left hand side, redemption and depreciation are reduced from £831,000 to £671,000, representing the withdrawal of the sum set aside for the depreciation of the ships. On the other side, the word "Steamships" falls out of the heading "Works, plant, &c.," and the corresponding item is proportionately reduced. At the same time, the item "Sundry debtors in London" is higher, owing to the inclusion of the amount due for the balance of the purchase price of the ships; this being only received in January of the present year. So far as other items in the balance-sheet are concerned, the variations are not of a material or unusual character. The only outstanding item is that of "Loan from bankers." This has nearly doubled during the year, owing in the main to the fact that we had to meet heavy additional expenditure on the cost of foreign coal, and did not, as I have already explained, receive correspondingly increased gas returns. It is another phase of the subject to which I referred earlier in my remarks. We have had to pay more than we expected owing to the enhanced price of coal. That will come back to us in time; but meanwhile we have to rely upon our bankers for a loan to meet this obligation.

Overhaul of the Distributing Mains.

As stated in the report, steady progress has been made with the overhauling of the various systems of distributing mains; and at certain stations there is definite evidence, in the reduced figure of gas unaccounted for, that the expenditure has had its effect. At other stations the leakage percentage figure is still too high; but no substantial improvement can be expected until a great deal more work has been done on the replacement of mains, and this, of course, means that for some time to come the cost of laying new main pipes in lieu of the worn-out ones will continue high. It is, however, expenditure which in the circumstances is very remunerative, in that it makes available for sale gas which would otherwise be unaccounted for.

The report also refers to the transfer of the present works in the centre of Nantes to a site purchased a number of years ago, outside the city, and alongside the River Loire. Owing to the growth of the town, and the position of the works, the authorities have long been desirous of their being removed from their present site. As a first step in this direction, a gasholder is being built on the new land and a main laid to connect up with the existing gasholders in the town, which will remain in use after the gas-making works are dismantled. No operations of special importance have been carried out at the other stations, beyond, of course, the ordinary and necessary upkeep and replacement.

As to the Future.

It is difficult, as I have said, to make any forecast as to the future; and the advent of the unexpected makes one hesitate to express any very definite opinions. The Company's balance-sheet represents its real position on the 31st of December—that is to say, full provision has been made for all liabilities, and for the effect of the present value of the franc. In the absence of anything in the nature of a major catastrophe—such as another coal strike, or a dramatic depreciation in the value of the franc—prospects may be regarded as distinctly

brighter, subject to those reservations which I have already dealt with, and which it would be imprudent to ignore.

THE NEW DIRECTOR.

In conclusion I should like to add my testimony and that of my colleagues as to the loss sustained by the death of Mr. John Mews, who had been a Director for nine years. He was among our oldest shareholders, and took a warm interest in our undertaking. In accordance with the Articles of Association, the vacancy thus caused was filled by the election as a Director of Mr. Charles Pelham Crookenden; and this nomination will come up for the confirmation of the shareholders later in the proceedings.

I now beg to move:

> "That the report of the Directors and the statement of accounts for the year ended the 31st of December last, now read, be received and adopted."

The DEPUTY-CHAIRMAN (Mr. Frank H. Jones) formally seconded the resolution.

Mr. LAWRIE TREWBY said he presumed that until the mains had been put right they could not expect a much greater dividend. Was the need for this work owing to the bad mains of the past, to the length of time they had been in the ground, or to the nature of the soil?

The CHAIRMAN replied that he did not think an increase in dividend would be affected by the expenditure which was now being incurred in connection with the mains. If his opinion was justified that things had a brighter appearance, they might, he hoped, look forward to a better dividend for the current year, regardless of the expenditure on the replacement of mains. Perhaps he might explain, in connection with this question of mains, that it was the custom in France at the time the Company's concessions were entered into—and in some parts it remained so to this day—to lay what was called the "Chameroy" pipe. It was made of wrought iron, tinned outside, and covered with asphalt. This remained the favourite pipe in France for a great many years; and in Paris it was still being laid. But really the "Chameroy" pipe came, he thought, to an untimely end as the result of the disturbed conditions brought about by the war. During the war, the difficulty was to run the works at all; and the amount of supervision and control that could be exercised was comparatively small. The mains to some extent doubtless suffered from these conditions. Additional heavy traffic was another factor which he thought hastened their end. For the last fifteen years or so, at any rate, the Company's practice had been, in laying new mains and replacing old wrought-iron tinned ones, to put down cast-iron pipes. This was the usual English practice; and there was no uncertainty whatever as to their lasting the full time of the concessions. Curiously enough, these "Chameroy" pipes seemed to have come to the end of their life almost simultaneously at all the Company's works. In some instances the main had been so badly eaten away that it was only the skeleton of it which had prevented the gas getting out altogether. This might be hard to realize; but it was an accurate illustration of what had happened to these mains. As he had explained, the liking for these pipes had not only been on the part of the Company, but was one of the French characteristics of gas supply. He well remembered the discussions that took place in his younger days, and the views expressed by the French engineers on the subject. The Société Technique de l'Industrie du Gaz en France, who dealt with matters pertaining to the technics of gas supply and distribution in that country, were at the present time very concerned with this question; and there had been formed a Committee, whose object it was to discover the cause of the great trouble that had arisen with these "Chameroy" pipes, and to decide upon the proper policy to adopt for the future. The Company, as he had said, were quite clear that the right course was to replace them with cast-iron pipes. Reverting to the general position of affairs, he could assure the shareholders that the most disappointed man in the room was himself. A year ago, he thought that on the present occasion he would have a more satisfactory story to tell; but circumstances, in the shape of the coal strike, had been against them. All he could say now was that, as far as it was possible to see ahead—that was, unless anything unexpected happened—the position a year hence should be a better one.

THE DIVIDEND.

On the proposition of the CHAIRMAN, seconded by Mr. W. G. BRADSHAW, it was agreed:

> "That the interim dividend of 3s. per share paid on the 1st of October last, less 7d. per share for duty in respect of all shares held in France, is hereby confirmed. That a final dividend for the year ended the 31st December last at the rate of 3s. per share be now declared; such final dividend on all the shares of the Company to be paid on the 1st of April next, the whole out of interest and profits and free of income-tax, subject, however, to a deduction for French Stamp and Transfer Duty of 8d. per share in respect of all shares held in France."

RE-ELECTIONS AND VOTES OF THANKS.

Mr. Frank H. Jones and Mr. A. M. Paddon were re-elected Directors of the Company, on the proposition of the CHAIRMAN, seconded by Mr. BRADSHAW; and the election of Mr. C. P. Crookenden as a Director was confirmed, on the proposition of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN.

Thereafter the auditors (Messrs. G. C. Goldsmid and W. B. Brady) were re-appointed, on the motion of Mr. H. S. REESON, seconded by Mr. A. BEVIS.

The CHAIRMAN said it was next his pleasant duty to move that the best thanks of the meeting be given to the staff of the Company in London and abroad for their services during the past year. These services had been ably rendered in circumstances of exceeding difficulty. Some of the raw material—which at times it had been very hard to get—had been far removed from coal such as they had been accustomed to deal with. The carbonization of coal in gas-works was at the best an operation which required great care; and their engineers and staff must have had a very hard time adapting their retorts to the various descriptions of coal which had been sought for in many parts of Europe to make up the deficiencies. In some cases their stocks had run very short.

Mr. A. E. JOHNSTON seconded the proposal, which was heartily passed.

Mr. ELIOT WILLIAMS, in acknowledging the vote on behalf of the staff both in London and France, said he was sure it would be deeply appreciated by all. In France they had passed through a very difficult year; but in spite of this, good results had been achieved.

Mr. REESON moved a vote of thanks to the Chairman and Directors for the able manner in which they had managed the affairs of the Company during a strenuous and difficult period. The Board merited the best thanks of the shareholders, who hoped that better dividends might be forthcoming in the future.

The vote having been seconded by Mr. HENRY JACOB, and cordially endorsed by those present,

The CHAIRMAN, on behalf of his colleagues and himself, returned thanks. He remarked that his managerial experience had not, unfortunately, been associated with the smooth sailing of the ship. It was not until they were suffering from the effects of the war that he took command; and they seemed to have been in troubled waters ever since. When he looked back over the long history of the Company, with its regular and satisfactory dividends, it made him regret exceedingly the stormy times through which it had of recent years been passing. The Board were grateful to the shareholders for their support during this difficult period, and trusted that there were better times ahead.

GAS REGULATION ACT APPLICATIONS.

SPECIAL ORDERS.

Deal and Walmer Gas Company.

To increase the borrowing powers of the Company and the rate of dividend on preference capital, to sanction the holding of annual meetings, and for other purposes.

Richmond (Yorks.) Corporation.—Amended Notice.

To extend the limits of supply, to authorize the Corporation to utilize scheduled land for the purposes of the undertaking, to make further provisions for regulating the supply of gas, and to authorize the Corporation to borrow further money.

Stroud Gas Light and Coke Company.

To empower the Company to raise additional capital, to pay interim dividends, and to establish profit-sharing; to relieve the Company from the obligation to supply gas for other than lighting or domestic use where the giving of such supply would render necessary the laying of a new main or an enlargement of the works, except as in such Order mentioned; and for other purposes.

DECLARATIONS OF CALORIFIC VALUE.

Blackrod Gas Company.—425 B.Th.U., in substitution for 450 B.Th.U. (July.)

Brentwood Gas Company (Ingatestone District).—550 B.Th.U., in substitution for 500 B.Th.U. (June 30.)

Knutsford Light and Water Company.—480 B.Th.U. (July 1.)

Warrington Corporation.—470 B.Th.U. (April 1.)

PRESENTATIONS AT GRAYS.

For the fourth year in succession the staff and employees of the Grays and Tilbury Gas Company were entertained by the Directors at a social evening held on March 19, when nearly 300 employees and their friends were present. The social was made the occasion for three presentations.

Mr. A. W. SUMNER, the Engineer and Manager, said that at the end of last year Mr. F. W. Sims, of the Distribution Department, had left the Company's service, after 23 years with them, to take up a more important position with the Hampton Court Gas Company. He handed Mr. Sims an inscribed gold watch, as a mark of the esteem and regard in which he was held by the whole of the employees.

Mr. SIMS expressed his thanks for the gift.

Mr. SUMNER then asked Mr. J. C. Lang to accept a present from the Welfare Scheme, as a mark of appreciation of his services since its inauguration three years ago. Mr. Lang had, at his invitation, accepted the post of Secretary at the inception of the Scheme, and had carried out the duties connected with it to everyone's satisfaction. Now that he had taken up more important duties at one of the outposts of the Company's area, however, he had been compelled to resign the position. The presentation was a silver pencil.

Mr. LANG, in accepting the pencil, said that whatever he had done for the Welfare Scheme had given him pleasure.

Mr. SUMNER remarked that the final presentation was not of a personal nature, but was in connection with the sport and athletic activities of the Company's employees. On behalf of Mrs. Sumner, he presented to the employees an inscribed silver cup, to encourage their participation in cricket, football, &c. Mr. Sumner mentioned that they had not been able to do a great deal in this direction owing to the lack of a suitable ground, but he hoped this difficulty would be overcome. He asked Mr. L. S. Dadd to accept the cup on behalf of the employees.

Mr. L. S. DADD expressed his thanks. The cup, he said, would undoubtedly stimulate their activities.

This year marks the centenary of the use of gas for lighting Wrexham; and the Chairman of the Gas Company (Mr. J. Oswell Bury) hopes to celebrate the occasion by the inauguration of a superannuation scheme for all employees.

RADIATION LIMITED.

At the Annual Meeting of the Company, held at the Grand Hotel, Birmingham, on March 28, the Chairman, Mr. H. JAMES YATES, in moving the adoption of the report and accounts, said:

It is over seven years ago that, as a result of much effort, extending over a number of previous years, it became possible to lay the first foundations of what has since become a great organization. The name "Radiation" was given to the newly-formed Company in allusion to those many years of research work which had led one into realms previously so unfamiliar in connection with gas stoves, that the work was looked upon askance in many quarters. Before the results of this research work of ours were embodied in the improved type of gas stoves which we created, there was in the public mind a distrust of gas stoves as a whole. How views are changed to-day! As the result of our creating and popularizing our new type of gas stoves, not only is the distrust of gas stoves a thing of the past, but it is recognized that they are among the greatest blessings and comforts—and, indeed, necessities—of present-day civilization.

As you are aware, the principal gas stove makers in this country belong to Radiation. Not only so, but it owns some of the largest foundry businesses of this country, also meter manufacturing businesses, enamelling concerns, and works carrying on other industries—all these contributing to make Radiation a vast self-contained manufacturing and distributing organization, whose interests reach throughout the world. As the result of a policy formed at the commencement of Radiation, and pursued with steady determination ever since, the business has developed to huge dimensions in a much shorter time than we in our most hopeful moments had anticipated. This development is still actively proceeding; and in view of what we have in hand and what we have in mind, and if nothing prevents us from continuing the policy which we have laid down and pursued, then the prospect should be one of continued progress.

One of the results often associated with amalgamations such as Radiation is that the incentive to maintain the same keen energy in the work on the part of those who had until then been responsible for their respective Companies, might have been impaired; but in our case the opposite has been the result. If this business had been in the hands of men who were content to take things easy, the developments and results we have achieved would have been impossible. When Radiation was formed, those who were responsible for it felt that by the "pooling" of the resources, energy, and specialized experience of the principal concerns in those industries in which our constituent Companies are engaged, consolidation and consequent increase of strength would be gained, and that in due course profits would be increased by this means and by the resultant large increase of the business—an end already so fully achieved.

A short time ago you received a circular making reference to the Company's policy and progress during recent years, and setting forth our proposals as to the shareholders of the Company deriving additional benefits from the outcome of the successful policy and labours of your Directors, who have done so much to bring your Company, in such a short period of time, to be one of the most successful manufacturing concerns in this country. Those who can look back over a number of years upon their connection as original shareholders with one or other of our constituent Companies, should realize what they have gained by exchanging their former holdings for shares in Radiation. They have had from the formation of Radiation an appreciated capital and an increased income. This was further enhanced by an augmented dividend for 1925, while this present year they will participate in a substantial free distribution of ordinary shares.

All the reserves of the constituent Companies were utilized for the purpose of capitalization into the shares of Radiation which you received. Consequently, after the formation of Radiation, we had to start afresh to build-up internal reserves; and considering that the Company is, as I have said, only about seven years old, I think that, if the shareholders compare their position with that of shareholders in many other concerns, they will realize that they have been particularly fortunate.

FINANCIAL PROPOSALS.

I propose now to deal with the special business, the resolutions in respect of which appear in the notice convening the meeting. The first is the resolution dealing with the increase of the Company's capital. We are submitting this resolution to you now because, after the capitalization which we propose has been effected, there will remain comparatively few unissued shares. It is always desirable that an undertaking such as this Company should have a considerable number of shares available for issue should occasion at any time arise. Moreover, it is a somewhat costly matter, having regard to the large number of shareholders, to convene special meetings of the Company, which course would have to be adopted if advantage were not taken of the opportunity of dealing with matters such as these at our annual general meeting. I shall ask you, at the proper time, to pass this resolution.

With regard to the resolution, which will also be submitted to you, for capitalization of accumulated profits which have now been transferred to this Company from the constituent Companies, I need hardly say that it is with some gratification that the Board are now able to make this recommendation to you. The Directors have for some time past had in mind the possibility of making such a proposal, but it was felt (and I think rightly so) that in the interest of the Company and its constituent Companies, every possible step should first be taken to create a position which would enable any serious trade, financial, or other difficulty, to be faced with equanimity. When you realize the extensive nature of our undertaking, and the possibilities which have to be anticipated and safeguarded, you will appreciate the absolute necessity for a conservative and cautious policy, and the fact that in pursuing this course the Board are only protecting—but adequately protecting—your interests.

It might have been possible—though, in the circumstances which have happened, it would not have been wise—for the Board to submit a proposal for capitalization earlier. As stated in the circular recently sent to you, we have had before us the deliberate purpose of conserving the Company's interests so as to ensure such a financial position as to avoid any serious fluctuation in dividends should the result of any one year's trading prove unsatisfactory. By the end of the period beginning with the first complete year of the Company's trading—viz., 1920—and continuing up to the end of 1924, we had reached that stage of financial stability towards which we had been working; but as you were informed in our recent circular, industrial difficulties had arisen in 1925 which, had they matured, would have created serious trouble for the Company. These difficulties, however, were settled on a satisfactory basis, with the result that in 1925 we had a successful year's trading.

Then again, in the early part of 1926 we had the dark cloud of the coal strike overshadowing us; but notwithstanding this we felt that the time had arrived when it would be not unreasonable if we increased our dividend—and this was done. Unfortunately the coal strike and the general strike did actually mature. Nevertheless our prosperity continued to be such during 1926 that we have felt the time is opportune to make a distribution to our shareholders from our internal reserves.

The circular sent to you also indicated that, provided no unforeseen and serious difficulties should arise in the future, it was anticipated that it would be possible to continue to pay dividend on the increased capital at the same rate as for the years 1925 and 1926. The circular which you received indicated generally the prudent policy which the Board had adopted, and the reasons which actuated them in doing so. I believe the wisdom of this policy must be apparent to all shareholders, so that I do not think I need enlarge upon it further.

There is one matter to which I desire to refer,—namely, the reasons which have led the Directors to call up the unpaid liability upon the partly-paid shares. Holders of these shares have frequently expressed to us their desire to have them converted into fully-paid shares by the calling-up of the unpaid liability upon them; and, further, it was felt that it would be unfair to holders of partly-paid shares if, having borne the liability on this uncalled capital all along, they should not now have the opportunity of participating as holders of fully-paid shares, in the present free distribution—provided they pay within the specified time the liability on their holdings.

It was because of our having in mind this matter of the partly-paid shares that we decided, as soon as we knew approximately the trading results of 1926, to issue the circular to which I have been referring. In view of the provisions in our Articles of Association as to the period of notice required to be given for the payment of calls, we had to issue this circular at once; and to make the date of our annual meeting a few days later than last year, so as to give the necessary time for these calls to be made and paid up.

The effect of the capitalization now proposed you will find clearly set out in the Directors' report, which has been in your hands for some days; and I think I cannot do better than refer to what is stated there—viz.:

> That each ordinary shareholder registered on April 13 next, will receive in respect of this capitalization one fully-paid ordinary share for every three *fully-paid* ordinary shares then held; and if this division results in a fraction in any holding, the fraction will be sold, and the cash proceeds paid to the shareholder. Any holder of ordinary shares whose calls are in arrear will, unless he pays such calls, only receive in respect of those shares fully-paid ordinary shares calculated upon the amount actually paid up.

Therefore I need hardly emphasize the necessity for every holder of partly-paid ordinary shares paying at once, if he has not already done so, the amount due upon those shares, which should have been paid on March 21.

In our circular it was stated that the capitalization would not subject shareholders to super-tax. We thought it better to include this statement in the circular for the benefit of shareholders in general, so as to avoid the necessity for correspondence from them on the subject. We took the precaution of consulting counsel on the point before making the statement; and I want you to appreciate that it was our reliance upon this advice which prompted us to give you the benefit of it.

With regard to the remaining resolution to effect a small alteration in the Articles of Association as regards the appointment of Directors, our Articles are at present of a somewhat restrictive nature in this respect, and possibly only contain power to appoint Directors from concerns or undertakings which the Company have taken or may take over. This restriction is undesirable for many reasons; and the alteration proposed will permit Directors not directly concerned with any of the Company's constituent Companies and firms to be appointed when such appointment is felt to be advisable in the interests of the Company.

BENEFITING THE EMPLOYEE.

In the circular you will have noticed that the Board have in contemplation a scheme for enabling employees of the constituent Companies to become shareholders on advantageous terms. Both before and since that circular was issued this matter has been receiving very careful consideration. On a subject such as this, it is extremely difficult to come to a conclusion which will meet the various views propounded, and at the same time secure the desired benefit to those particularly interested—viz., the employees.

It has been suggested that it might probably be better to devise a scheme which (while giving to the employees who are to have the opportuntity of participating in it the same return upon the money invested as they would receive if they became shareholders) would

avoid the necessity of their taking-up shares. If such a scheme can be devised, it will obviously be an advantage to employees; and we are at present engaged in studying the question deeply. You will agree with me that it is unadvisable to attempt to explain to you the various suggestions which are under consideration. But you may rest assured that so soon as a practical solution is reached, it will be given effect to; and I should like to make it clear that, whatever scheme may be adopted, it will be one which will provide for the contemplated benefits to the employees.

Research Work.

As I have always been anxious that the shareholders of this Company should be informed as to our work in the development of new goods, it has been my practice, year by year, to keep you in touch with these matters. I referred a few minutes ago to our extensive research work; and I want to impress upon you first and foremost that it is this research work of ours which has been the backbone of the success of this Company. As you are aware, we have our chemical and physical laboratories in our various works; but our pure research work is all carried out at the Central Research Laboratories, Radiation House, London, which is my headquarters. Naturally our research work entails a heavy expenditure; but I am more than ever convinced that this expenditure is well warranted by the results attained. You will realize, of course, that the expense in connection with work of this kind is not limited to the laboratory, as after a successful result has been reached, a considerable amount of work has to be done in transforming the results of our research work into a practical commercial proposition. Our experience frequently is that, once we have done this, we see cheaper apparatus produced, attempting to follow on the lines of our new goods, but always deficient in some direction. Either the appliance has a low efficiency, or it is incapable of meeting the varying local gas supply conditions throughout the country, or else proper precautions have not been taken to ensure complete combustion, and therefore the absence of smells.

Cooker Design.

I mentioned in my address to you in 1922 that our work in connection with cooker design promised results which would lead to the development of a type of stove that would ultimately cause all existing designs to become obsolete. As a result of our research work in 1923, our "New World" cookers were placed on the market. They were an immediate success. We have definitely standardized the "New World" type of oven, which is characterized by its single burner and direct flue-outlet at the bottom. With our further experience, we have been able to extend these principles, and are producing this year a series of models which will widen still more the field for cooking by gas. In the new design, the cooking space is extended, and there is provided, in addition to the usual high-temperature cooking zone where roasting and similar work is done, a definite space which is available for low-temperature operations—such as stewing or the cooking of milk puddings. All these operations can be carried on simultaneously; and there is no need to change the position of the food in the oven during the cooking process.

A particular advantage of the single-burner oven construction, as compared with the two-burner oven, is that it ensures absolutely correct automatic cooking. You will remember one of the novel features which characterized the "New World" ovens was the introduction of the "Regulo." By means of this device, cooking can be carried out automatically without the usual attention on the part of the user. Further—and this is, perhaps, more important still—the user is assured that, by means of the "Regulo," the same results can be attained from day to day, irrespective of any variations which may occur in the gas supply during the day. The user has only to place the food in the oven with the "Regulo" at the correct mark, and at the end of the specified time a perfectly-cooked dish can be removed. A further striking feature of these new ovens is that now, for the first time, whole dinner menus, consisting of meat, vegetables, and pudding, in considerable variety, can easily be cooked with one setting of the "Regulo" dial; the whole of the dishes *being placed in the oven at the same time, and also withdrawn together.*

In regard to the hotplate, our "Rado" burner, with its spreading flame, has enabled us to ensure that combustion of the gas shall be complete, and has superseded the drilled-ring burner, which is so liable to choke-up and cause incomplete combustion, with consequent smells. This "Rado" burner, in conjunction with our single-unit bar, gives the highest efficiency yet attained in a gas cooker hotplate.

Injector-Ventilator Gas Grates.

The demand for the Radiation Thermo-XX "Injector-Ventilator" gas grates during the past year has still continued to grow; and the public are more and more realizing the advantages of installing Radiation gas grates in their homes. On the occasion of the opening of our Central Research Laboratories, you will remember I made reference to the work which we had then been carrying out for some years in investigating the type of energy emitted by various heating appliances. This work involves the determination of the intensity of the energy at various wave-lengths; and we have measured by the spectrometer the distribution of energy from a wide range of heating apparatus, including coal fires, gas fires, and electric fires, as well as the gas mantle and other sources of heat and light. This work is being continued; and an experimental gas fire has been evolved in the laboratories which possesses most striking advantages. In all these investigations, however, we take the utmost care to satisfy ourselves, by prolonged tests, that whatever new departure we may eventually decide to introduce shall be a desirable one from all points of view—including the physiological standpoint.

The advantage of heating by radiant energy is now common knowledge; but the importance of the quality of the energy had not been envisaged generally at the time we commenced this work, although I am glad to see that the need for consideration of this phase of the matter is now being recognized. It is to be anticipated that this special development work of ours will not only lead up to further improvement in our own apparatus, but will also result in a general raising of the standard in all makes of gas-heating appliances; and this, in its turn, will react to the benefit of the whole industry.

At the present time we have large extensions going on in six of our works in different parts of the country. This will necessarily entail some disorganization for the time; but when these buildings are completed and fully equipped, we are looking forward to their assisting to establish further the position of the Company.

Now as regards the prospects for the present year—1927—I always think it unwise to prophesy. The beginning of this year has naturally suffered from the effects of the coal strike, but we are hopeful that the trading for the year may prove satisfactory.

The Dividend.

If the dividend now recommended by the Directors is authorized, the warrants will be posted to you on April 28 next; and these will be accompanied by the allotment letters for the free issue of shares. Last year we paid the interim dividends at the end of July; but we propose to pay these in future in October, so as to equalize the periods between the interim and final dividends.

I will now conclude by moving:

> "That the report and balance-sheet for the year ended Dec. 31, 1926, as presented by the Directors, be received and adopted, and that a final dividend of 3½ p.ct. on the fully-paid and partly-paid ordinary shares, free of income-tax (making 6 p.ct. in all for the year), and a bonus of 6d. per share on the fully-paid and 3d. per share on the partly-paid ordinary shares of the Company, free of income-tax, be and the same are hereby declared; and that the same be payable on the 28th day of April, 1927."

The resolution was carried unanimously; and the proceedings concluded with a vote of thanks to the Chairman.

GAS COMPANIES' RESULTS FOR 1926.

Barnard Castle.

At the annual meeting of the Barnard Castle Gas Company, a dividend of 2 p.ct. was declared on the original consolidated stock, and £1 15s. 7d. p.ct. on the new ordinary stock, less income-tax. Gas sales increased during the year.

Bishop's Stortford.

The sale of gas, 827,833 therms, was 8·7 p.ct. more than that of the preceding year. The sale of electric current, 58,197 units, showed an increase of 9·7 p.ct. To meet the enhanced cost of production, the charge for gas was increased by 2d. per therm as from the beginning of the Christmas quarter, but this advance was withdrawn at the end of the same quarter. Final dividends at the following rates were declared (less income-tax): On the "A" ordinary stock, £3 0s. 6d. p.ct.; on the "B" ordinary stock, £2 17s. 6d. p.ct.; on the "C" 5 p.ct. preference stock, £2 10s. p.ct.; and on the "D" 4 p.ct. preference stock, £2 p.ct. This left a balance of £1421 to be carried forward.

Bridgwater.

The profit for the year was £5289. Interim dividends of 6 p.ct. on the "A" stock and 3 p.ct. on the "B" and "C" stocks were paid; and at the annual meeting final dividends were declared of 9 p.ct. on the "A" stock and 4½ p.ct. on the "B" and "C" stocks. The balance carried forward was £408. After the general meeting, an extraordinary meeting was held at which it was adopted that £6000 be raised by the creation and issue of a further amount of consolidated stock, and that £6000 be borrowed by the creation and issue of debenture stock, to rank *pari passu* with the £5998 of 4 p.ct. debenture stock of the Company.

Canterbury.

Owing to the prolonged coal stoppage and the heavy cost of foreign coal purchased by the Company, the Directors were reluctantly compelled to advance the price of gas as from the reading of the meters for the September quarter and mid-reading of the December quarter by 1d. and 0·8d. per therm respectively. These advances were equal to an increase of 15 p.ct. only. The higher prices obtained for residuals during the latter part of the year enabled the Directors to announce that the price of gas would be reduced as from the reading of the meters for the December quarter by 1·8d. per therm, thus reverting to the pre-strike price for the current quarter. The sale of gas showed an increase of 3·4 p.ct. as compared with the preceding year. A final dividend of 5 p.ct., less income-tax, was declared, making the uniform dividend on the total capital 9 p.ct. for the year.

Cromer.

The sale of gas, compared with that for 1925, showed an increase of 12·3 p.ct. After providing for interest, income-tax, and all other charges, there remains a balance of profit of £3441 available for division. The Directors recommended the declaration of a dividend for the year ended Dec. 31 at the statutory rate—viz., £5 12s. 6d. p.ct. (less income tax). A balance of £943 remained to be carried forward. To meet the enhanced cost of production, the price of gas was advanced 2d. per therm as from Aug. 3; but this advance was withdrawn from the commencement of the current quarter.

Dawlish.

The sales of gas showed an increase of 10 p.ct. The net profit was £806; and a dividend of 10 p.ct. per annum was declared.

Derry.

Presiding at the annual meeting of the Derry Gaslight Company, Mr. R. H. Smyth recorded that they had been able, in exceptionally

difficult circumstances, to provide a full and continuous supply of gas throughout the coal strike. This had been accomplished in the first instance by purchasing at great cost large quantities of foreign coal, and of oil, and by the co-operation of the staff and employees. It was an extremely anxious time for all concerned; and their thanks were due to the stokers and oil-gas operators who worked under difficult, and at times dangerous, conditions carbonizing a great variety of foreign fuel. The cost of keeping faith with their customers was reflected in the increased expense of production, which had risen from £21,393 to £32,092. This increase was not met by the increases in the price of gas over the twelve months. Hence the necessity for continuing the temporary increase in price into the first quarter of the current financial year. They would revert to the pre-strike figure again on April 1. A gratifying feature of the year was the addition of 500 new customers and the substantial increase in output of 9 million c.ft., which, succeeding the previous increase of 15 millions, represented nearly 20 p.ct. during the past two years.

Dorking.

The consumption of gas for the half-year ended Dec. 31 last shows an increase of 10·3 p.ct. over the corresponding period of the previous year. After providing for interest on debenture stock, the available balance was £3462, out of which the payment was declared of dividends at the rate of 10 p.ct. per annum on the "A" and "B" shares, 7 p.ct. on the "C" shares, and 5 p.ct. on the "D" shares. Despite the coal strike, the supply of gas was fully maintained.

Douglas.

The net profit was £7151. Owing to the coal strike, the price of gas had to be increased in July to 6s. 6d. per 1000 c.ft., and later to 7s. 6d. Immediately following work in the coalfields, this was reduced to 5s. 4d. A final dividend of 35s. per share was declared.

Gosport.

Presiding at the annual meeting of the Gosport District Gas Company, the Chairman (Mr. W. E. Churcher) stated that new records were made during 1926; the quantity of gas sent out being 341 million c.ft., an increase of 35 million c.ft., or 15 p.ct. Sales at Fareham had again exceeded all expectations; and since the taking over of the Fareham Company in 1924, the sale of gas had increased in that district by nearly 60 p.ct. The total number of meters was now 9317. It was obvious that the existing plant could not continue to break records indefinitely; and it would be necessary during the coming year to extend the carbonizing plant, and make such other arrangements as might be found necessary to meet the increasing use of gas—the estimated increase during 1927 being approximately 9 p.ct. From the end of the September quarter, they found it necessary to increase the price of gas to their consumers. The Directors had decided, however, again to reduce the price in all districts at the end of the present quarter by three-fifths of a penny per therm, and hoped by the end of the June quarter to remove entirely the increase necessitated by the coal stoppage. Dividends were declared making a distribution for the year of £6 15s. 9d. p.ct. on the consolidated stock.

Seaford.

At the annual meeting of the Seaford Gas Company, Mr. N. Denham, a Director, said that, to meet the heavy increase in the cost of coal, the Directors increased the price of gas by 6d. per 1000 c.ft. as from last mid-summer; but this, together with a further 2d., had been taken off as from the meter readings for the Christmas quarter. The increase in gas sales for the year amounted to 18·42 p.ct. A final dividend of £5 2s. 6d. p.ct. per annum, less tax, on the ordinary stock was declared.

Sevenoaks.

The profit and loss account showed that, after allowing for payment of debenture interest, interim dividend, and other interest, the amount available for dividend was £9223; and dividends at the following rates were declared: 10 p.ct. on the "A" shares, and 7 p.ct. per annum on the "B" shares, both less income-tax. This absorbed £1733, leaving £7489 to be carried forward. The abnormal increase in the cost of coal during the coal stoppage necessitated increases in the price of gas of 1d. per therm on Oct. 1, and 3d. per therm on Nov. 1. The price was reduced from 1d. per therm from Jan. 1 this year; and there will be a further reduction of 2d. per therm from the end of the March quarter. The consumption of gas showed an increase of 6¼ million c.ft. The number of gas appliances fixed during the past year constituted a record. To meet the growing demands for gas, and to bring the works up to date, a new retort house is under erection.

Swansea.

The demand for gas was well maintained throughout the year, in spite of industrial depression. The development of the Morrison Works has been proceeded with; and it is anticipated that the first water gas section will be available for gas making very soon. The total receipts amounted to £239,576, and the total expenditure to £186,933; the balance carried to profit and loss account being £52,643. Dividends were declared of 7 p.ct. per annum on the redeemable preference stock, and 5 p.ct. per annum on the ordinary stock.

Uxbridge.

Summarizing the general position at the annual meeting of the Uxbridge, Maidenhead, Wycombe, and District Gas Company, Mr. H. S. Button, J.P., C.C. (Chairman), said the capital expenditure had increased by 6 p.ct., and the business done by 11 p.ct. The general network of supply was now practically completed, and it remained for them gradually to fill in the necessary capillaries to complete the whole system. The report of the Directors stated that the balance available for dividends was £27,764. They recommended payment of dividends (less income-tax) of 5 p.ct. on the 5 p.ct. preference stock, 5¼ p.ct. on the 5¼ p.ct. preference stock, and 6¼ p.ct. per annum on the ordinary stock and the Maidenhead stock. This left £3731 to be carried forward.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

Depressing conditions still rule in this market, and the demand is far from sufficient to absorb available supplies. Reductions in prices are limited by present costs of production; but exporters report that quotations are still too high to obtain more than a small proportion of available business in our former Continental markets. Output is having to be restricted all round by idle time, and this again increases production costs.

There are rumours of impending troubles in the American and French coalfields, and, if these materialize, they may make a considerable difference to this market. If we could regain some of our old South American trade, it would provide a very useful outlet, and the additional quantity would help us to get prices down. In the case of France, we should still have to compete with other Continental producers, but at least we could hope for a share. It is poor comfort having to anticipate the troubles of others, but certainly something is required to give a fillip to the trade of this district, and others have benefited to the full from our troubles of recent years.

Wear Special gas makes, quoted at 17s. 6d. f.o.b., and best qualities at 17s. to 17s. 6d., are fairly well placed; but seconds are in need of trade, and weakly held at 15s. 6d. to 16s. Durham coking is weak at 15s. to 15s. 9d. One or two contracts have come to this district during the week; but these have been at low prices, and, in general, forward business is not being obtained in anything like normal quantities.

The coke market is not so firm. Gas makes for shipment are quoted 22s. 6d. to 23s. f.o.b., and blast-furnace and other sorts are easier.

YORKSHIRE AND LANCASHIRE.

The demand for gas coals in Yorkshire and Lancashire is easing off. The export market moves sluggishly, with spasmodic ideas in respect to price from each centre.

There has been a slightly better request during the past week for secondary descriptions of household fuel; and with collieries working a little less irregularly, the market is rather better situated in this direction.

Industrial fuels appear to be steadier, with indications of slightly increased prices for delivery over the summer.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports: South Yorkshire—Hards, Association, 21s. 7½d. to 21s. 10½d.; screened gas coal, 21s. 6d. to 22s.; washed trebles, 21s. to 22s.; washed doubles, 19s. 6d. to 19s. 9d.; washed singles, 18s. 9d. to 19s. 3d.; washed smalls, 15s. 6d. to 15s. 9d.; rough slack, 13s. to 13s. 3d.; smithy peas, 21s. 6d. to 24s. per ton. West Yorkshire—Hartleys (f.o.b. Goole), 19s. to 21s.; washed trebles, 20s.; washed doubles, 19s. to 20s.; washed singles, 18s. to 18s. 6d.; washed smalls, 15s. to 15s. 6d.; unwashed trebles, 19s. to 20s.; unwashed doubles, 17s. to 17s. 3d.; rough slack, 13s. to 13s. 6d.; coking smalls, 12s. to 13s. per ton. Derbyshire and Nottinghamshire—Top hards, 22s. 9d. to 24s. 6d.; washed trebles, 21s. to 22s.; washed doubles, 19s. 6d. to 20s. 6d.; washed singles, 18s. 6d. to 19s.; washed smalls, 15s. to 15s. 6d.; unwashed doubles, 19s.; rough slack, 13s. to 14s. per ton. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 18s. to 20s.; gas coke, 25s. to 30s.; furnace coke, 28s. to 30s. per ton.

MIDLANDS.

There has been a further sharp fall in house coals owing to the sudden shrinkage of demand under the influence of the weather, the effect of which has been to immobilize a large amount of traffic, and to throw a heavy burden on the distributor. Many merchants who blame transport delays for the loss of the market are afraid to refuse to accept delivery because of the effect on their relations with the collieries.

The reduction in pithead prices has varied widely. Some very heavy cuts have been made on particular descriptions of house coal for the London market in view of the accumulation of unsold fuel in the distributive channels. Cannock collieries announced a reduction of about 2s. In other districts, policy was dictated by the circumstances of individual firms or the position of the coalfields in relation to big consuming centres. For best deep hand-picked, 40s. at the pithead is still required in some cases; but good medium qualities of domestic coal can be bought at about 34s.

The effect is hardly appreciable in regard to industrial grades. Steams make round 20s., D.S. nuts 15s. to 15s. 6d., beans 13s., and best nutty slacks 9s. to 11s. Slacks have appreciated perhaps 1s. on a shorter supply. Oven men adhere resolutely to the higher basis of 22s. on rail for hard furnace coke. Most of the pits are now playing at least two days a week. Merchants and dealers are, of course, delaying depreciation as far as the exigencies of competition in a very sluggish market permit.

Mr. William Pytherth, a mechanical engineer, employed by Messrs. Hughes & Lancaster, of Acrefair, Wales, who died suddenly at Helmshore, Accrington, was in 1914, in Budapest, engaged at the gas-works on behalf of his firm. When war broke out, he was allowed to complete his work under escort, and was afterwards interned for four years. He had not had good health since then.

A series of cookery demonstrations has been given at Accrington by Miss H. H. Tuxford, M.C.A., under the auspices of the Accrington Gas Board. A special cake baking demonstration was promoted, for which the prizes offered were gas wash-boilers, gas fires, and a set of gas irons and stand. Previously, Miss Tuxford conducted successful demonstrations at Great Harwood. A census of gas appliances at Great Harwood shows there are in use 2010 gas cookers, 2115 wash-boilers, 1374 grillers, 124 gas fires, 30 geysers, 86 gas irons, 45 radiators, and 35 gas engines.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *March* 28.

The market for pitch continues quiet, and the price is nominal at about 90s. per ton in bulk at works.

Creosote maintains its firm tone, and is steady at about 9d. per gallon f.o.b. steamer.

Pure toluole is about 2s. 3d. to 2s. 4d. per gallon, pure benzole about 2s. to 2s. 1d. per gallon, and 95/160 solvent naphtha 1s. 8d. to 1s. 9d. per gallon.

Phenol is firmer at about 6¾d. to 7d. per lb.

Tar Products in the Provinces.

March 28.

The average values for gas-works products during the week were: Gas-works tar, 60s. to 65s. Pitch, East Coast, 77s. 6d. to 82s. 6d. f.o.b. West Coast—Manchester, 75s. to 82s.; Liverpool, 77s. 6d. to 82s. 6d.; Clyde, 80s. to 82s. 6d. Benzole, 90 p.ct., North, 1s. 7d. to 1s. 8d.; crude, 65 p.ct. at 120° C., 1s. 1d. to 1s. 1½d., naked at makers' works; 50-90 p.ct. naked, North, 1s. 8d. to 1s. 9d. Toluole, naked, North, 1s. 8½d. to 1s. 9½d., nominal. Coal-tar crude naphtha, in bulk, North, 8d. to 8½d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 5½d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 7½d. to 7⅝d.; salty, 7¼d. to 7½d.; Scotland, 7¼d. to 7⅝d. Heavy oils, in bulk, North, 9d. to 9¼d. Carbolic acid, 60 p.ct., 1s. 8½d. to 1s. 9½d. prompt. Naphthalene, £11 to £14; salts, 100s. to 110s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Tar Residuals, Ltd.

The businesses of Messrs. Walter Waugh & Co., Ltd., of 4, Lloyd's Avenue, E.C., Messrs. Walter H. Brown & Co., Ltd., of 4, Fenchurch Avenue, E.C., and the Tar Products Department of Messrs. Simon-Carves, Ltd., of Manchester, have been amalgamated and transferred to a new Company which has been registered under the name of Tar Residuals, Ltd., the registered office of which will be at 4, Lloyd's Avenue, London, E.C. 3. The three Directors of each of the two first-named firms, with three Directors of Messrs. Simon-Carves who have in the past looked after this portion of their business, will constitute the Board of the new Company.

TRADE NOTES.

"Cascade" Continuous Tar-Still.

Messrs. Clayton, Son, & Co., Ltd., have received a second repeat order from the Wandsworth, Wimbledon, and Epsom District Gas Company, for one of their "Cascade" system patent continuous tar-stills, to be installed at the Mitcham Works.

Boiler for Whaley.

In our reference, on p. 758 of last week's "Journal," to the boiler Messrs. Radcliffe & Sons, Ltd., are supplying to the Chapel Whaley and District Gas Company, the working pressure was stated to be 2000 lbs. This should, of course, have been 200 lbs.

Coal Handling Plant.

The Vertical Gas Retort Syndicate, Ltd., 17, Victoria Street, Westminster, have received an order from the Mid-Kent Gaslight and Coke Company for a complete coal handling plant for their Snodland Works. This comprises a conveyor, elevator, overhead storage bunker, and "Jaffa" electrical charging and discharging machine arranged for automatic filling.

Messrs. Jenkins & Co.'s Contracts.

The Worksop Gas Company have placed an order with Messrs. W. J. Jenkins & Co., Ltd., of Beehive Works, Retford, for a mechanical handling plant specially designed for working on stop-end retorts; the contract on the coaling side including an elevating and storage plant, De Brouwer suspended charger, and generating set. An innovation for works with stop-end retorts will be the new electrically driven discharging machine, which will be supplied for drawing coke from the retorts. The Braintree Gas Company have decided to instal a coal-handling plant consisting of an elevator and storage hopper, De Brouwer suspended charger, and generating set. An order for the whole of this work has been placed with the firm. The Hertford Gas Company have accepted Messrs. Jenkins's tender for purifiers, which will be erected complete. It will be necessary to divert the existing mains; and this work is also included in the contract. The Borough of Pontefract Gas Department are extending their purifying plant; and this contract the firm have now nearly completed.

CONTRACTS OPEN.

Carburetted Water Gas Plant.

The Sidmouth Urban District Council are inviting tenders for the supply of a carburetted water-gas plant. [See advert. on p. 831.]

Coal.

The Belfast Gas Committee are inviting tenders for the supply of best gas coal. [See advert. on p. 831.]

Tenders are invited by the Birkenhead Corporation for the supply of various descriptions of coal. [See advert. on p. 831.]

Tenders are invited by the Gas Committee of Lytham St. Annes for the supply of peas and slack. [See advert. on p. 830.]

Gasholder, Governor, and Livesey Washer.

Tenders for the above plant are invited by the Sidmouth Urban District Council. [See advert. on p. 831.]

Pipes.

The Gas Committee of the Middleton Corporation are inviting tenders for the supply of cast-iron pipes. [See advert. on p. 831.]

Extensions at Halifax.

An inquiry by the Ministry of Health, conducted by Mr. G. Ewart Rhodes, was held at the Halifax Town Hall last week into the Town Council's application to borrow £80,000 for the following purposes: £40,000 for constructing vertical retorts at the gas-works and allied work; £21,040 for work done there some time ago; and £18,960 for new gas mains, &c. The last-named loan was suggested to be for fifteen years, the £21,000 odd for not more than ten years, and the other not more than fifteen years. With the exception of the £21,040 application, the evidence was formal. With respect to this amount, it was explained to the Inspector that for some time it had been the policy of the Gas Committee to pay for extensions out of revenue, but lately they had felt it would be a better policy to modify that rule. The work had been paid for, but out of revenue, and they wished to transfer it to capital account. The Inspector commented that it was a most unusual type of application. There was no opposition; and following the hearing of evidence the Inspector visited the gas-works and the places where mains are proposed to be laid.

Gas Company's Efficient Administration.

The following is an extract from the "Herts and Essex Observer" for March 12: "Gas companies, in common with most other corporate bodies, are seldom handed bouquets. Whether deserving of them or not, they usually receive more kicks than halfpence; the public being as a rule liberal with criticism but chary of giving praise. Credit should, however, be given where credit is due; and the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company are well deserving of commendation for the admirable way in which they handled their undertaking during the extremely difficult times resultant from the long-drawn coal stoppage last year. Though driven to pay abnormally high prices for it, they managed to obtain sufficient coal from abroad to 'carry on;' and, in face of the fact that the nature of the coal supplied was such that, according to their Chairman, two, three, and even four men were at times required to do the work that one could do under normal conditions, they 'kept the wheels running,' and were able to meet all requirements. A specially pleasing feature—so far as the consumers are concerned—is that, though the Directors were compelled to increase the price of gas by 2d. per therm in order to meet the increased cost, that advance only ran for three months. Both Directors and management certainly deserve thanks for their efficient administration during a very difficult time."

Price of Gas at Kenilworth.

The terms under which Coventry will supply gas to Kenilworth when the City Corporation take control of the Kenilworth Gas Company were announced to the Council on March 22. The Chairman (Mr. C. H. Barwell) said the Coventry Corporation had agreed to amend the Coventry Corporation Bill in order to meet the most important objections. Kenilworth's petition, however, had not been withdrawn; the Council having reserved the right to oppose the Bill before the House of Commons Committee if it was not amended on the lines agreed. The agreement provides "that the price of gas in Kenilworth will not exceed by more than 4d. per therm the price of gas in the city of Coventry, with a maximum of 16·4d. per therm. That within a period not exceeding eight years the price of gas in Kenilworth will be reduced so as not to exceed by more than 2·4d. per therm the price charged in Coventry, provided Kenilworth is supplied with gas from the Foleshill Works of the Corporation." The undertaking is to be transferred to the Corporation one month after the passing of the Bill. Mr. Barwell said that, while they had not secured all the concessions they desired, the price clauses were very much more advantageous to the district than those contained in the original Bill. Immediate reduction in the price of gas would be effected, and material reductions would operate when Kenilworth was supplied with gas from the Foleshill Works. This supply was anticipated within a much shorter period than the eight years mentioned in the agreement.

Visit to the Manchester Meter Testing Station.

On Monday, March 21, a party of students of "Gas Supply," numbering about twenty-five, from the Manchester College of Technology and the Salford Royal Technical College accepted the invitation of Mr. H. N. Barrow, J.P., Chairman of the Manchester City Justices' Meter Testing Committee, to visit the Testing Station. They were received by Mr. Barrow and Mr. Winterbotham, the Chief Inspector; and after a short account of the history of the gas meter and of its testing had been given by Mr. Barrow, the party was split up into small sections, each with an efficient guide. The large and beautifully equipped station, with its facilities for rapid testing of meters of any size, was much admired; and the visitors were shown all the up-to-date methods of testing, and also the arrangements for maintaining the temperature at the station constant both winter and summer. After partaking of refreshments provided by the Meter Testing Committee, Mr. H. R. S. Williams, Engineer and Manager of the Altrincham Gas Company (who is at present in charge of the Gas Supply Classes at Manchester), in moving a vote of thanks to Mr. Barrow and his staff, referred to the unique opportunity the students had had of studying the methods adopted in what was considered the finest meter testing station in England. The methods used had gone far towards making the gas meter what it now was—one of the most accurate commercial measuring instruments in use. Mr. J. Pope, Distribution Superintendent of the Altrincham Gas Company, seconded; and the vote was carried by acclamation. Mr. Barrow and Mr. Winterbotham replied; and a most interesting and instructive visit was brought to a close.

Blackburn Smoke Abatement Exhibition.—Among the principal exhibitors at this exhibition, which is being held in the Drill Hall, are the Richmond Gas Stove and Meter Company, with a complete display of their gas cooking and heating appliances, including the well-known "Bungalow" and "Ranelagh" cookers.

STOCK MARKET REPORT.

CHINESE affairs continued to play an important part on the Stock Exchange last week; and although optimistic views prevailed with regard to the ultimate result of the conflict, the latest news with its threat of an attack on the settlement had a depressing effect. Business was dull and inactive; but prices in the gilt-edged market were more affected by the failure of the London County Council Loan, 80 p.ct. of which was left with the Underwriters. This result is a clear indication that investors still require a 5 p.ct. yield. There was no outstanding feature in the Foreign Market. Although more interest was shown in Home Rails, the improvement was very slight.

Conditions on the Industrial Market were irregular. While Tobaccos, Cements, and Oils were stronger, Textiles, Stores, and other classifications lost ground. Little improvement can be expected until the Budget proposals are announced.

It is gratifying that the Gas Market continued to be the exception. Ignoring *ex* div. reductions, quotations generally showed improvement. A remarkable increase was a rise of 4 points, to 99-102, in Cardiff Consolidated. The yield is now below 6 p.ct., which is low compared with the yield of other companies of similar size. Derby consolidated and Liverpool ordinary were exceptions, and drooped 2 points and 1 point respectively at the local exchanges; the yield in these cases being a little over 7 p.ct. for the former Company, and just under 7 p.ct. for the latter. Commercial 3¼ p.ct., Newcastle consolidated, and South Suburban 5 p.ct. were all marked up 1 point. The Bombay Company have announced a final dividend of 4 p.ct., making 8 p.ct. for the year.

The following transactions were recorded during the week:

On Monday, Bournemouth 7 p.ct. 12, Commercial 4 p.ct. 84½, 85½, 85⅝, 3½ p.ct. 82, 83, Croydon maximum dividend 70, 70½, European 6½, 6 11/32, Gas Light and Coke 87½, 87⅝, 87¼, 87⅜, 6 p.ct. debenture 102, Imperial Continental 134½, 135, 136½, 137, Oriental 101, 102, Plymouth and Stonehouse 5 p.ct. 109¼, Primitiva 14s. 6d., South Metropolitan 98, 98½, 3 p.ct. debenture 59⅜, South Suburban 5 p.ct. 102, 102½.

On Tuesday, Alliance and Dublin 81, Cape Town 8, Continental Union 20½, Gas Light and Coke 87½, 3½ p.ct. maximum 50½, 60½, 60¾, 60⅝, 4 p.ct. preference 75⅜, 76½, 76¼, Primitiva 14s. 6d., 14s. 6½d., 14s. 10½d., South Metropolitan 97⅜ 98½, 3 p.ct. debenture 58⅜. South Suburban 5 p.ct. 102¼. Tottenham "B" 90. Supplementary prices, British 5 p.ct. debenture 96½, Norwich 3 p.ct. debentures 53½. 54.

On Wednesday, Alliance and Dublin 4 p.ct. debenture 66½. Bristol 5 p.ct. 87, European 6⅜, 6½, Gas Light and Coke 87¼, 87½, 87⅝, 3½ p.ct. 59⅜. 4 p.ct. preference 75⅜, 3 p.ct. debenture 60¼, 5 p.ct. debenture 99⅜. Imperial Continental 136, Oriental 101, Primitiva 14s. 6¾d., 14s. 7¼d., 14s. 9d., South Metropolitan 98, 98½, South Suburban 5 p.ct. 102. Supplementary prices, Malta and Mediterranean 7 p.ct. preference 100s., 101s. 3d., 7½ p.ct. preference 100s., 101s. 3d.

On Thursday, Colonial 26s. 1½d., European 6⅛, 6½, 6¼ *ex* div., Gas Light and Coke 87, 87½, 87⅜, Imperial Continental 136½, 137, Oriental 101½, 102, Primitiva 14s. 7½d., 14s. 9d., 14s. 9¾d., 14s. 10¼d., South Metropolitan 97⅜, Tottenham 5 p.ct. 107½, 3½ p.ct. 90½. Supplementary prices, Mid-Kent 57s.

On Friday, Alliance and Dublin 86, European 6⅜, Gas Light and Coke 87½, 87¾, 6 p.ct. Brentford debenture 102½, 5 p.ct. debenture 99⅜, Imperial Continental 137½, Primitiva 14s. 6⅜d., 14s. 7½d., 14s. 9d., 14s. 9¾d., 14s. 10½d., 4 p.ct. debenture 71, 71½, 4 p.ct. debenture (1911) 72, San Paulo 6 p.ct. preference 7½, South Metropolitan 97½, 97⅝, 99, 6½ p.ct. debenture 100, South Suburban 5 p.ct. 102½, 5 p.ct. debenture 93½, Tottenham 5 p.ct. 108½. Supplementary prices, Liverpool 5 p.ct. 80½, Montevideo 6 p.ct. debenture 97½, Yorktown and Blackwater new 5 p.ct. preference 87.

The absence of Treasury Bill maturities made no difference to the conditions in Lombard Street; and though money was more usable, accommodation was freely obtainable at 3⅜ p.ct. Old day-to-day loans were renewed at 4 p.ct. Business in the discount market was extremely small, and rates remained unaltered. Treasury Bills, of which £45,000,000 were offered and allotted, averaged £4 6s. 8·9d., or 6·33d. p.ct. below the previous week's rate.

In the Foreign Exchange Market there was a demand for Canadian dollars, which went to a premium over United States dollars, closing at 4.85 5/16, as compared with the New York rate at 4.85 1/16. French francs remained at 124; Italian lire depreciated to 106.35; and the Dutch rate was unchanged at 12.13¾.

Silver was bought on Indian account, and the cash price rose to 25 1/16d. per oz. Gold remained at the nominal rate of 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3, 1925. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

Issue.	Shares.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Mar. 25.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices.
£			%p.a.	% p.a.				
171,978	Stk.	Feb. 10	5	5	Aldershot 5 p.c. max. C.	70—73	..	..
229,992	,,	,,	4	4	Do. 4 p.c. Pref.	68—71	..	..
1,551,868	,,	Sept. 30	6½	6½	Alliance & Dublin Ord.	83—88	..	81—86
374,000	,,	Jan. 13	4	4	Do. 4 p.c. Deb.	65—68	..	66½
800,000	1	Oct. 14	1/7½	1/7½	Bombay, Ltd.	1—1½	..	..
170,000	10	Mar. 10	8½	8½	Bournemouth 5 p.c.	12½—13½	..	..
500,000	10	,,	7	7	Do. B 7 p.c.	11½—12⅝	..	12
275,000	10	,,	6	6	Do. Pref. 6 p.c.	10⅞—11½	..	..
50,000	Stk.	Jan. 13	3	3	Do. 3 p.c. Deb.	53—56	..	..
163,025	,,	,,	4	4	Do. 4 p.c. Deb.	73—76	..	..
857,900	,,	—	—	—	Brighton & Hove 6 p.c. Con.	100—105	..	..
811,800	,,	—	—	—	Do 5 p.c. Con.	90—95	..	..
1,327,500	,,	Feb. 24	5	5	Bristol 5 p.c. max.	88—89a	..	..
855,000	,,	Mar. 24	8	7	British Ord.	105—108*	−2	..
100,000	,,	Dec. 30	7	7	Do. 7 p.c. Pref.	112—117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	75—80	..	..
100,000	10	Dec. 9	8	6	Cape Town, Ltd.	7—8	..	8
100,000	10	Oct. 28	4½	4½	Do. 4½ p.c. Pref.	6—7	..	..
150,000	Stk.	Dec. 30	4½	4½	Do. 4½ p.c. Deb.	68—73	..	..
696,880	,,	Feb. 24	6	6	Cardiff Con. Ord.	99—102	+4	..
227,880	,,	Dec. 30	7½	7½	Do. 7½ p.c. Red. Deb.	100—103	..	..
197,150	,,	Feb. 24	5	6½	Chester 5 p.c. Ord.	86½—91½b	..	..
79,185	1	Sept. 30	†2/-	†2/-	Colombo Ltd. Ord.	27/—29/-	..	..
84,495	1	,,	1/4§	1/4§	Do. 7 p.c. Pref.	20/—22/-	..	..
231,490	1	Oct. 14	1/9⅜	1/7½	Colonial Gas Assn. Ld. Ord.	25/6—27/6	+/6	26/1½
173,990	1	,,	1/9⅜	1/7½	Do. 8 p.c. Pref.	21/—23/-	..	..
1,518,280	Stk.	Feb. 24	5½	5⅝	Commercial 4 p.c. Cap.	88—86	..	84½—85⅝
660,000	,,	,,	5/8/4	5/8/4	Do. 3½ p.c. Cap.	81—84	+1	82—83
475,000	,,	Dec. 30	8	8	Do 8 p.c. Deb.	54—57	..	..
800,000	,,	Sept. 30	§2	§1	Continental Union, Ltd.	28—33	..	29½
200,000	,,	Mar. 10	7	7	Do. 7 p.c. Pref.	79—82	..	..
767,560	,,	Mar. 10	6½	6½	Croydon sliding scale	96—99	..	..
408,100	,,	,,	5	5	Do. max. div.	77—80	..	..
492,370	,,	Feb. 24	6	9	Derby Con.	104—106c	−2	..
45,000	,,	Dec. 30	4	4	Do. Deb.	73—75c	..	..
200,000	,,	Mar. 10	5	5	East Hull Ord. 5 p.c.	76—80	..	..
50,000	,,	Dec. 30	5	5	Eastbourne 5 p.c. Deb.	90—95	..	..
1,002,180	10	Mar. 24	†8	†8	European, Ltd.	5⅞—6⅜*	−⅛	..
18,747,460	Stk.	Feb. 10	5/1/4	5	Gas Light & Coke 4 p.c. Ord.	86½—88½	..	87—87⅜
2,600,000	,,	,,	8½	8½	Do. 8½ p.c. max.	58—61	..	59½—60½
4,187,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	75—78	+1	75⅞—76½
6,809,620	,,	Dec. 30	8	8	Do. 8 p.c. Con. Deb.	58—61	..	60½
181,315	,,	,,	—	6	Do. 6 p.c. Br'tf'd Rd. Db.	100—105	..	102—102½
1,642,770	,,	,,	—	5	Do. 5 p.c. Red. Deb.	99—100	..	99⅜
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,800	,,	Mar. 10	6⅜	6⅜	Hastings & St L. 5 p.c. Conv	88—90	..	..
358,740	,,	,,	5⅞	5⅞	Do. 3½ p.c. Conv.	65—70	..	..
70,000	10	Oct. 14	†10	†10	Hongkong & China, Ltd.	12—18	..	..
173,200	Stk.	Mar. 10	5	5	Hornsey Con. 3½ p.c.	67—69	..	..
1,976,000	,,	Nov. 11	†10	10	Imperial Continental Cap.	134—137	..	134½—137½
226,170	,,	Feb. 10	8½	8½	Do. 8½ p.c. Red. Deb.	67—69	..	..
226,242	,,	Mar. 10	6½	6½	Lea Bridge 5 p.c. Ord.	92—97	..	..
2,145,907	,,	Feb. 24	5½	5½	Liverpool 5 p.c. Ord.	79½—80½b	−1	80—80⅜
400,000	,,	Sept. 30	7	7	Do. 7 p.c. Red. Pref.	104—106b	..	..
165,786	,,	Feb. 24	9	8	Maidstone 5 p.c. Cap.	110—115	..	..
62,460	,,	Dec. 30	8	8	Do. 8 p.c. Deb.	52—57	..	..
75,000	5	Dec. 9	†7	†7	Malta & Mediterranean	5½—5⅝	..	..
541,920	Stk.	Nov. 25	†6	†5	Montevideo, Ltd.	80—83	..	..
2,061,815	,,	Feb. 24	5	5	Newcastle & Gateshead Con.	73½—74½d	+1	..
260,929	,,	,,	4	4	Do. 4 p.c. Pref.	68½—69½d	..	..
691,795	,,	Dec. 30	8½	8½	Do. 8½ p.c. Deb.	65—69d	..	..
131,786	,,	—	—	—	North Middlesex 6 p.c. Con.	93—95	..	..
800,000	,,	Nov. 25	7	9	Oriental, Ltd.	97—102	..	101—102
188,120	,,	Dec. 30	7½	7½	Plym'th & Ston'house 5 p.c.	105—110	..	109½
414,500	,,	Feb. 24	7½	7½	Portsm'th Con. Stk. 4 p.c. Std.	100—105	..	..
286,732	,,	,,	5	5	Do. 5 p.c. max.	76—79	..	..
2,389,909	1	—	—	—	Primitiva Ord.	14/3—15/3	+/3	14/6—14/10½
282,300	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	85—87	..	..
600,000	Stk.	Jan. 27	4	4	Do. 4 p.c. Red. Deb. 1911	70—72	..	72
434,963	,,	Dec. 30	—	4	Do. 4 p.c. Cons. Deb.	70—72	..	71—71½
150,000	10	Mar. 24	6	6	San Paulo 6 p.c. Pref.	7½—7⅝*	−⅛	7½
135,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	47—50	..	..
970,000	Stk.	Sept. 16	6	5⅝	Sheffield A	96—98e	..	..
419,968	,,	,,	6	5⅝	Do. B	96—98e	..	..
1,047,000	,,	,,	6	5⅝	Do. C	96—98e	..	..
90,000	10	June 11	4	—	South African	4—6	..	..
4,909,896	Stk.	Feb. 24	5	7	South Met. Ord.	97—99	..	97½—99
1,895,445	,,	Jan. 13	3	3	Do. 3 p.c. Deb.	57—60	..	58⅜—59⅜
734,000	,,	Mar. 10	6½	6½	Do. 6½ p.c. Red. Db.	99—101	..	100
91,500	,,	Feb. 24	8½	6½	South Shields Con.	108—110d	..	..
1,343,795	,,	Mar. 10	6½	6½	South Suburban Ord. 5 p.c.	101—104	+1	102—102½
868,897	,,	Dec. 30	5	5	Do. 5 p.c. Deb.	93 96	..	93½
647,740	,,	Mar. 24	5	5	South'mpton Ord. 5 p.c. max.	74—77*	−2	..
131,375	,,	Dec. 30	4	4	Do. 4 p.c. Deb.	68—73	..	..
350,000	,,	Feb. 24	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
300,000	,,	Dec. 30	6½	6½	Do. 6½ p.c. Red. Deb.	102—104	..	..
120,000	,,	Feb. 24	7½	7½	Tottenham District A 5 p.c.	105—110	..	107½—108½
882,275	,,	,,	6½	6½	Do. B 3½ p.c.	89—92	..	90—90½
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97—100	..	..
181,358	,,	Dec. 9	4	4	Do. 4 p.c. Deb.	72—75	..	..
386,251	,,	Mar. 10	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c.	68½—69½d	..	..
197,394	,,	Mar. 10	6½	6½	Do. 5 p.c. pref.	85—90	..	..
66,220	,,	,,	5	5	Do. 5 p.c. Maidenh'd	85—88	..	..
91,800	,,	,,	6½	6½	Wandsworth, Wimbledon, and Epsom—	88—88	..	..
80,000	,,	Mar. 10	8½	8½	Wandsworth A 5 p.c.	119—124	..	..
255,896	,,	,,	7	7	Do. B 5½ p.c.	99—104	..	..
433,535	,,	,,	5/19/0	5/19/0	Do. C and New	87—92	..	..
382,000	,,	,,	6§	6§	Wimbledon 5 p.c.	95—100	..	..
90,000	,,	,,	7½	7½	Epsom 5 p.c.	101—106	..	..
88,418	,,	Dec. 30	8	8	5 p.c. Deb.	54—57	..	..

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RATCLIFFE & SONS (HAWARDEN), LTD., HAWARDEN, CHESTER.

APPOINTMENTS, &c., WANTED.

GAS Cookery Demonstrator, fully qualified (Diplomée National Training School of Cookery), is free to accept Daily or Weekly Engagements.
Miss PARKYN, 192A, WEST END LANE, WEST HAMPSTEAD, LONDON, N.W.6.

APPOINTMENTS, &c., VACANT.

THE South Metropolitan Gas Company has a Vacancy on its Constructional Staff for an ENGINEER. The Duties will be wholly those pertaining to the Design and Erection of New and Remodelling of Old Plant. Experience in the conduct of a gas undertaking would be helpful, and a sound Scientific Education is indispensable.
Salary, £1000 per Annum.
Applications to be addressed to the undersigned.
By order,
FRANK DAY,
Secretary.
709, Old Kent Road,
London, S.E. 15,
March 16, 1927.

MESSRS. NEWTON, CHAMBERS, & CO., LTD., Thorncliffe Ironworks, near Sheffield, require the Services of a responsible DRAUGHTSMAN with Experience in Gas and Chemical Works Plant.
Applicants are requested to state their Qualifications, Age, Experience, Salary required, and date Duties could be begun after appointment. Company's house available for successful Applicant.

CONTRACTS OPEN.

BOROUGH OF LYTHAM SAINT ANNES.
(GAS DEPARTMENT.
THE Gas Committee of the Corporation invite TENDERS for the Supply of 10,000 Tons of PEAS or SLACK, to be Delivered free to Gas-Works Sidings, Lytham, for a period of Six Months from the 1st day of May, 1927.
Specifications and Forms of Tender may be obtained on Application to the Engineer and Manager, Gas Offices, Orchard Road, Lytham St. Annes.
Tenders, endorsed "Tender for Gas Fuel," should be lodged in the office of the undersigned not later than April 18, 1927.
The lowest or any Tender will not necessarily be accepted.
JNO. H. RANFT,
Engineer and Manager.
March 25, 1927.